

Cardio7 Operation Manual



Warranty

- This product was made through strict quality control and examination. The repair and compensation standards follow the consumer damage compensation regulations of the Ministry of Finance and Economy.
- The warranty for this product runs for 1 year. (2 years in EU) But the warranty for accessory runs for 6 months.
- This product is guaranteed against faulty workmanship for a period of 1 year. Under this warranty, we undertake to repair free of charge at our service centers.
- When having troubles during this period, please inform us the model name, serial number, date of purchase and a description of the problem you are experiencing.

Caution
Federal law restricts this device to sale by or on the order of a physician

Contact Bionet

Contact Us

If you have any questions or comments relating to our products or purchasing, please contact the telephone numbers or E-mail below. You can talk to our sales people. Bionet always welcome your enquiries. Please contact us.

- Product and purchasing → TEL: +82-2-6300-6418
- After sales service → TEL: +82-2-6300-6458

※ When the product is not operating correctly, please contact our customer service center with the name of the model, serial number, and a description of the problem you are experiencing.

Product purchase and accessory order

Please contact us or retailer for the information about product purchase or accessory order.

- TEL: +82-2-6300-6418 / E-mail: sales@ebionet.com

Technical assistance

Please contact this number for technical assistance.

- TEL: +82-2-6300-6458 / E-mail: service@ebionet.com

Fee-based Service

If you wish to make a claim when the product is damaged through misuse, we charge repair fee. Please read the manual before you make a claim.

<ul style="list-style-type: none">- For simple inspection without giving instruction or disassembling the product- For reinstalling due to poor installation by the retailer	Fee charged: From the second time Free of charge: One time
<ul style="list-style-type: none">- For poor installation due to moving- For reinstallation after initial installation due to customer's require- For reinstallation due to customer's unskilled installation- For offering service when a foreign substance is put or mis-cleaned by the customer	Fee charged

1. The warranty does not cover cleaning, adjusting and instruction for use.
(Separate standard will apply when repair is impossible)

2. A fault of customer

When the product is damaged or broken due to customer's improper use or misuse

- When the power cord is replaced improperly by the user
- When the user drops the product while moving, after the initial installation
- When the user uses unauthorized accessories
- When the product is repaired by unauthorized person

3. Others

- When the product is damaged by a natural disaster (fire, flood or earthquake)
- When durability of accessories ends

Definition of WARNING, CAUTIONS and NOTE

- In order to stress the contents of this manual, we define the terms as below. Please follow the warning and cautions instruction.
- The manufacturer or service agents are not responsible for the damage resulting from inappropriate use or carelessness.

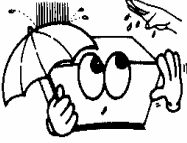

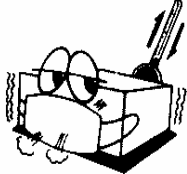
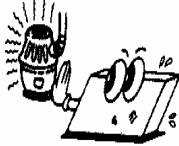
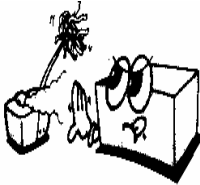
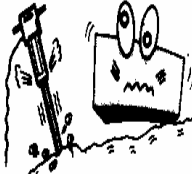
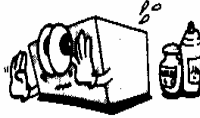

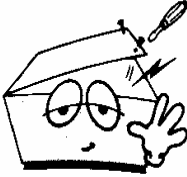

WARNING
There may be serious injuries, fatal accidents or financial damages if you violate this instruction

CAUTIONS
There may be slight injuries or reduced damages if you violate this instruction

NOTE
There may not be any dangerous events, but it is important to note this instruction for installation, use, maintenance or repair

Environment Instructions

- Please do NOT use or place the product in such an environment explained below.

	Steamy environment. Do not use the product with wet hands.		Direct sunlight.
	Place where the temperature and humidity condition are extreme (Recommended temperature and humidity range for use are 10~40°C and 30~85%, respectively.)		Near electronic heaters
	High humidity or ill-ventilated place		Place where excessive shock or vibration may occur
	Place exposed to flammable chemicals or explosive gas.		Please note there is no dust or metal in the product.
	Do not disassemble the product. The product warranty does not cover problems resulting from disassembling the product.		Do not plug the power supply cord before installing the product completely. It may cause damage on the product.

Safety Instructions for electricity

Please note the following precautions before using the product.

- Is the power supply cord proper? (100 - 240V AC)
- Is every cord connected properly to the product?
- Is the grounding connected correctly? (Otherwise, noise can occur.)

NOTE

In order to avoid signal noise, do not place the product near power generators, X-ray equipments, broadcasting equipments or mobile electric cords. These may cause the product to output result inaccurately. It is important to use an independent electric circuit and a stable grounding. When sharing an electrical outlet with other appliances, the result may also be inaccurate.

NOTE

The classification of Cardio7 is as below.

- Its classification against electric shocks is Class I , Type-BF.
- It is not proper to use this product near an inflammable anesthetic or a solvent.
- IEC/EN 60601-1(Safety of Electric Medical Equipment) standard, Noise events: A class & IEC/EN60601-1-2(Electromagnetic Compatibility Requirements) standard, Noise level: B

NOTE

Diagnosis of CardioXP needs to be confirmed by medical specialists.

NOTE

The accessories connected to analog or digital connector should be authorized in accordance with IEC standards. (E.g. IEC 950 for data processing equipment and IEC 601-1 for medical equipment) Moreover, every composition should correspond with EN 60601-1:1993.








WARNING

This equipment must only be connected to a supply mains with protective earth.

WARNING

Do not touch accessible connector pins and the patient simultaneously

Safety Symbols

Symbols	Contents
	Isolated patient connection. (IEC 601-1-Type BF)
	Power on
	Power off
	This symbol identifies a safety note. Ensure you understand the function of this control before using it. Control function is described in the appropriate operation manual.
	Conductor provides a connection between equipment and the potential equalization bus bar of the electrical installation
	External Signal IN/OUT Port
	ECG Signal Input Port

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NOTE
Due to continuing product innovation, specifications in this manual are subject to change without notice.

Chapter 1. General Information

1) Product Overview

2) Product Features

3) Product Configuration

- Basic components and Accessories
- Optional components
- Body Configuration
- Front Panel
- Control Panel
- Power

4) System Installation

- Precautions for Installation
- Power Connection
- Patient Cable Connection
- Paper Installation
- System Start

5) System Setup

- Reset

1) Product Overview



Cardio7 is an electrocardiogram (EKG) device capable of measuring and recording 12 channels of cardiac signals of patients. The device enables operators to record cardiac signals, review them using various viewing modes, and perform automatic detection of cardiac conditions.

In addition, the device allows operators to enter patient information for it to be printed alongside cardiac signals, so that operators can sort and manage charts conveniently. Furthermore, user convenience has been further enhanced by addition of a functionality that can initiate EKG recording & saving, filter enhancing, parameter sorting and automatically detecting cardiac signal all at once by pressing a key only once.

A battery (optional) can be added to the device so that device can be operated conveniently during bedside visits or emergency conditions.

2) Product Features

- Print 12-channel (ch) cardiac signals with reports in; 3ch+1 rhythm; 3ch+3 rhythms; 6ch+1 rhythm; 12ch rhythms patterns on an A4 size printing paper.
- Record a rhythm from 1 channel for 60 seconds or 5 minutes then print it on an A4 size printing paper.
- Record and print 12 channel rhythms continuously and simultaneously.
- Calculate heart rate, P-R-T axis and PR, QRS, QT and QTc widths from recorded signals automatically and print them on report for use in rhythm analysis.
- Get diagnostic reports using automatic detection functionality.
- Able to modify filter setting, signal sensitivity, printing speed, channel view settings and rhythm settings and print on previously recorded EKG signals to aid data analysis.
- Able to attach a battery so that the device can become portable.
- Manage chart effectively by addition of patient and operator data on EKG printout.
- Up to 120 EKG recordings can be saved on device memory.

3) Product Configuration

The Cardio7 system consists of follows. Unpack the package and check the follow contents are included. Also, be sure to check any damage to the body and accessories.

Basic components and accessories



- ① Cardio7 body (1 EA)
- ② Patient cable (1 EA)
- ③ Limb electrodes (1 SET)
- ④ Chest electrodes (1 SET)
- ⑤ ECG paper (1 EA)
- ⑥ ECG Gel (1 EA)
- ⑦ User manual (1 EA)
- ⑧ Power cable (1 EA)

Optional components

① →



② →



← ③

① Battery (1 EA)

② Hanger (1 EA)

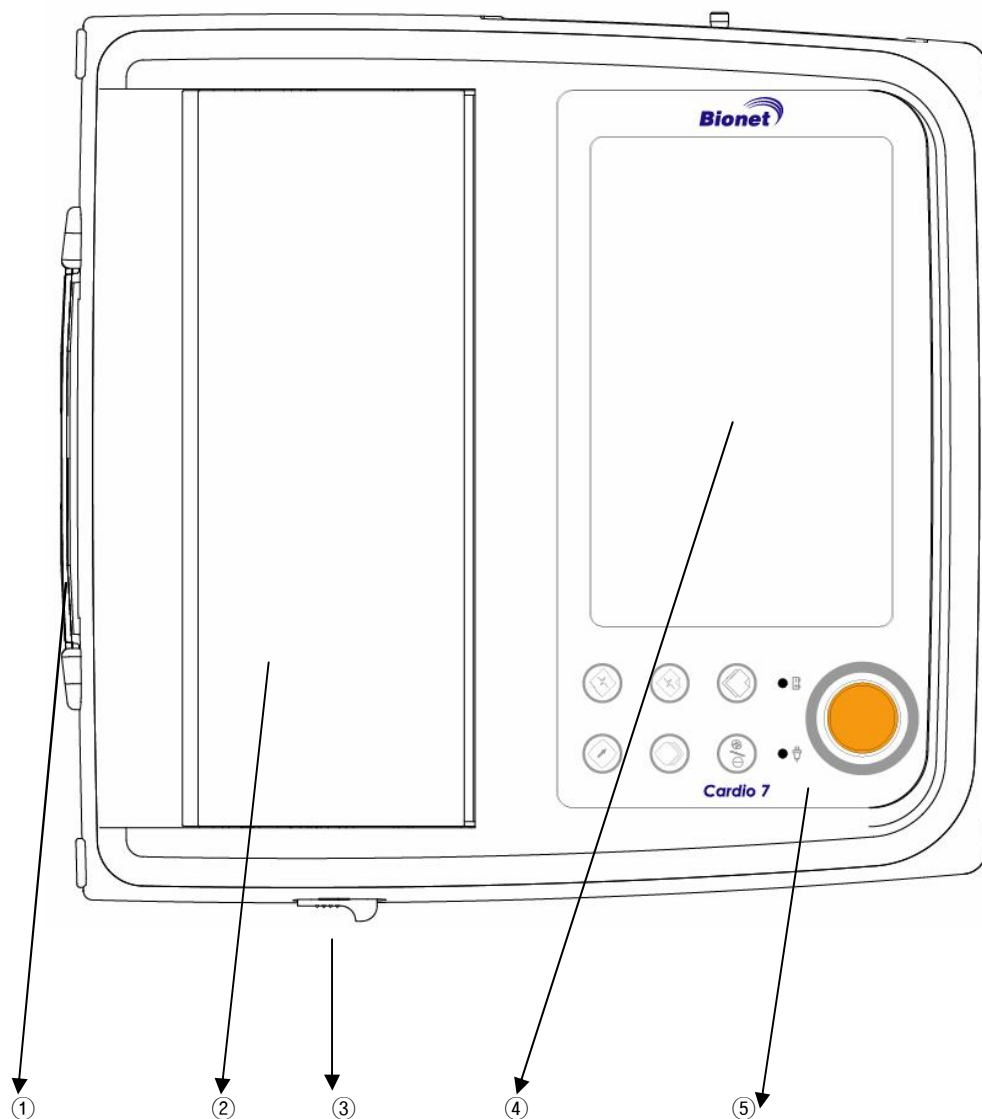
③ Cart (1 EA)

Caution

You may have distortion or signal noise when you use nonstandard or other brand accessories. We strongly recommend you use only the authorized accessories which we supply.

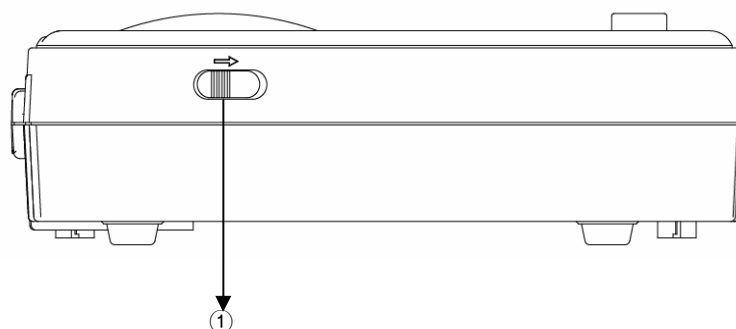
Body Configuration

■ Top view



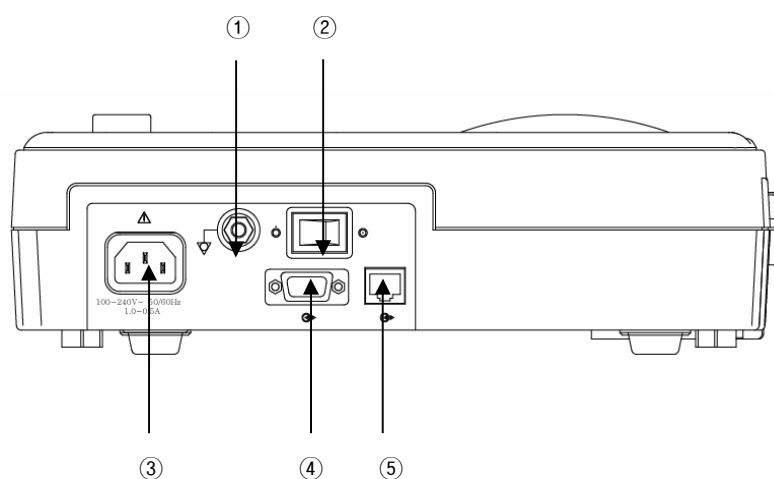
- ① Handle
- ② Printer cover
- ③ Printer cover opening button
- ④ LCD
- ⑤ Control panel

■ Front view



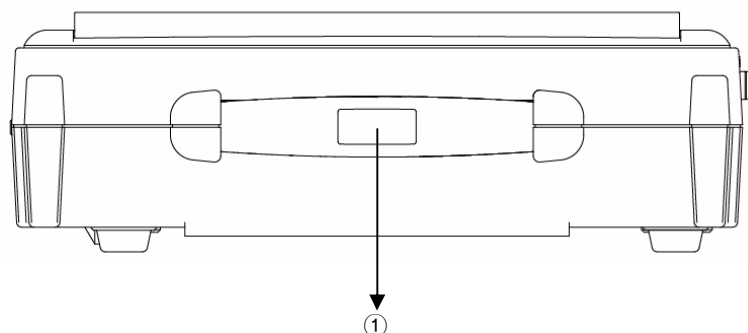
- ① Printer cover opening button

■ Rear view



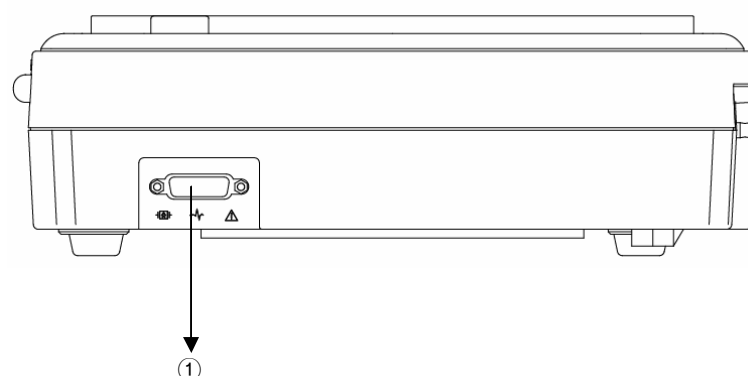
- ① Protective ground terminal
② Power switch
③ AC power connection part
④ RS-232C serial port
⑤ RJ45 LAN port

■ Left side view



① Handle

■ Right side view

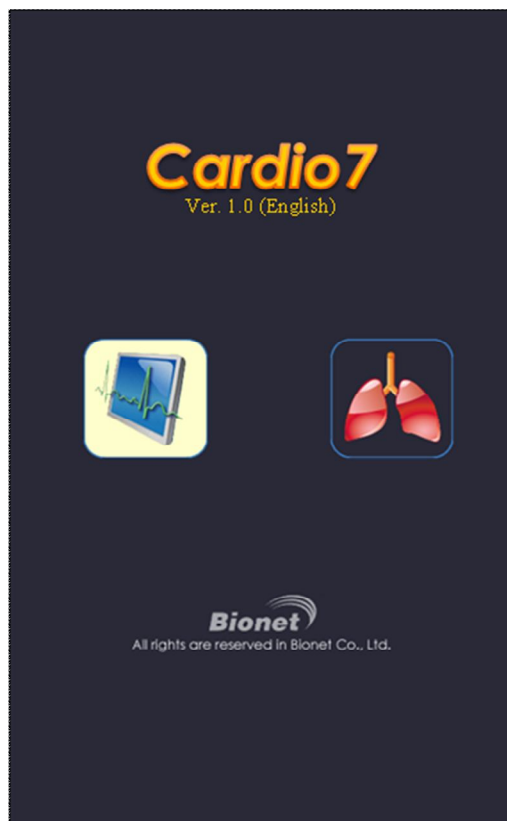


① Patient cable connection port

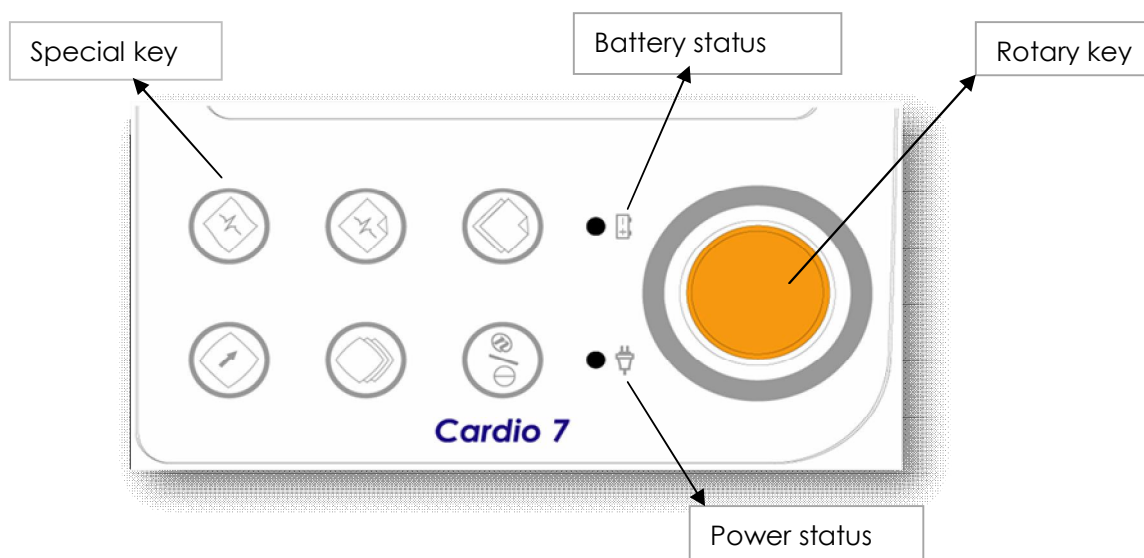
NOTE

RISK OF ELECTRICAL SHOCKS - DO NOT OPEN THE DEVICE: Device disassembly is only authorized to individuals with Bionet service authorization.

Front Panel



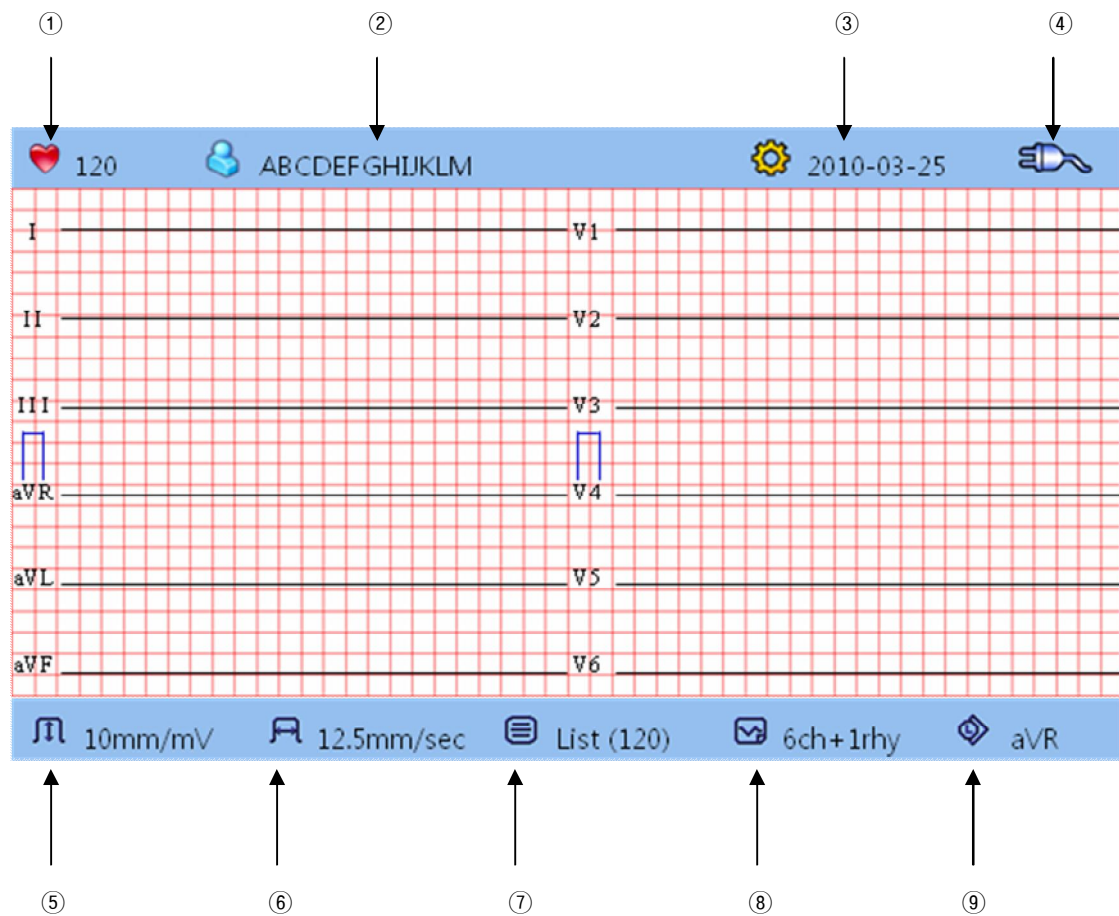
Graphic display



During device boot up, you can see the system version and the company name.

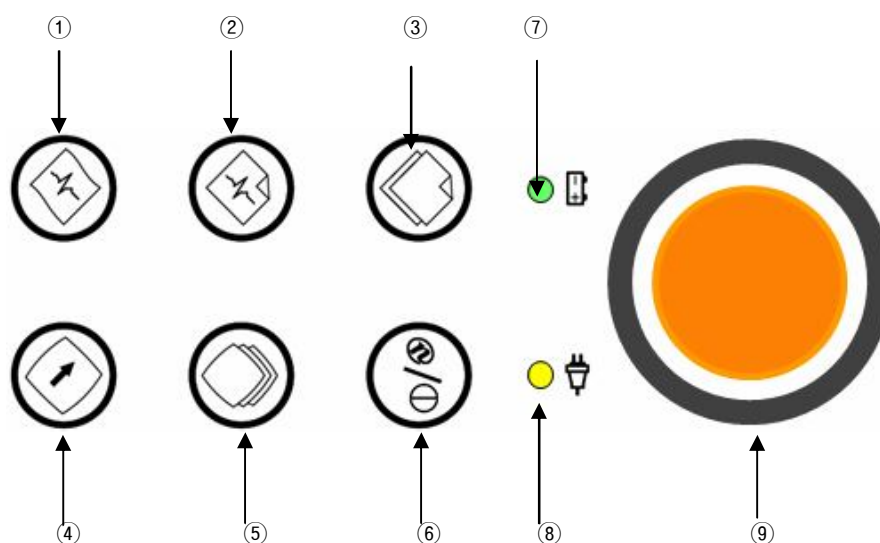
Cardio7 Operation Manual

The following descriptions explain data on the graphic LCD.



- ① Display a heart rate.
- ② Display patient ID
- ③ Display a date
- ④ Display battery status or AC power connection status
- ⑤ Display ECG sensitivity with one of 5, 10, 20, and Auto (mm/mV)
- ⑥ Display printing speed with one of 12.5, 25, and 50 (mm/sec).
- ⑦ Display number of data in memory.
- ⑧ Display a printing report channel form with one of 3ch+1rhy, 3ch+3rhy, 6ch+1rhy, 12ch rhy, 60s 1rhy and 5m 1rhy.
- ⑨ Display a rhythm channel setup with one of I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5 and V6

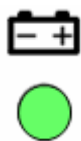

Control Panel




■ Button

①		Print out the rhythm data in an A4 size or continuous.
②		Print out the data in a selected form after recording 10sec data or 60sec data and signaling them.
③		Process the recorded data with or without revision and print them out.
④		Change a view of the graphic display window to initial main window.
⑤		Change a view of the graphic display window.
⑥		NET : Execute communication using networking ESC: Cancel commands or change into the former mode for main menu printing. (‘NET’ key works only under no main screen. ‘ESC’ key works except that.)

■ LED

⑦		A light indicator lets you know that there is battery and show your current battery charging status. A red light indicator lets you know that the battery is charging and a green light indicator lets you know the batter is fully charged
⑧		Show the state of connection with AC adapter and a green light indicator when plugging AC adapter into device

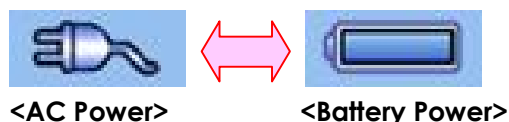
■ Rotary switch

⑨		Used when navigating or selecting menu items (Same functionalities can be achieved by touching menu items on the screen)
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Power

■ AC Power

When AC Power is connected to the device, Power LED will light green; battery charging will start when battery is connected to the device.







■ Battery Power

While battery is connected to the device, when AC Power is disconnected and system power is on, the device will get its power from the battery and display battery power icon (shown on the right upper side). When battery power is lacking, an alarm sound will ring from main body and LCD display will show "Battery Low" message. Connect AC Power immediately or the device will automatically shut down in a few minute.

- Full charging time : Maximum 16 hours
- Time to use continuously: Over 1 hour(100 ECG printouts)

■ Display battery power status

-  : Battery fully charged
-  : Battery charge half-full
-  : Battery charge low
-  : Battery almost fully drained

■ Replacing battery

When replacing battery of this device, same type of the battery should be used.

- Type: GP1300AAM-PACK Ni-MH battery (12V/2600mAh)
- When to replace: Battery will automatically be charged when the device is connected to AC power, and cannot be charged when separated from the device. Battery is designed to have charging cycle of 500 times or more. If the device could only last 20 minutes or less on a battery power after fully charged, the battery needs to be replaced. Additionally, when a battery pack is damaged or leaking chemicals, replace it immediately. Do not use damaged battery packs with the device.

NOTE

When replacing fuse, use the same type (T3A250V) to protect the device from risk of fire

4) System Installation

Precautions for Installation

While installing Cardio7, please pay attention to following items:

- Use the equipment at between the ambient temperature 10~40°C and humidity 30~85%.
- Check the power cord is properly connected, and the probe carefully handled.
- Do not plug multiple cords in a power outlet.
- Install and operate Cardio7 body on a level place.
- Connect the device to ground when there are noises on output signals.
- Do not use a power cord that may make a connection noise.
- Device preference will be recorded in the internal memory even when it is off.
- Prevent any shock or excessive force that may cause damages the device.
- Place the device away from any dust or flammable materials.

Power Connection

The equipment needs electrical power to operate. Plug in one end of the power cable to wall socket and another to Cardio7.

Patient Cable Connection

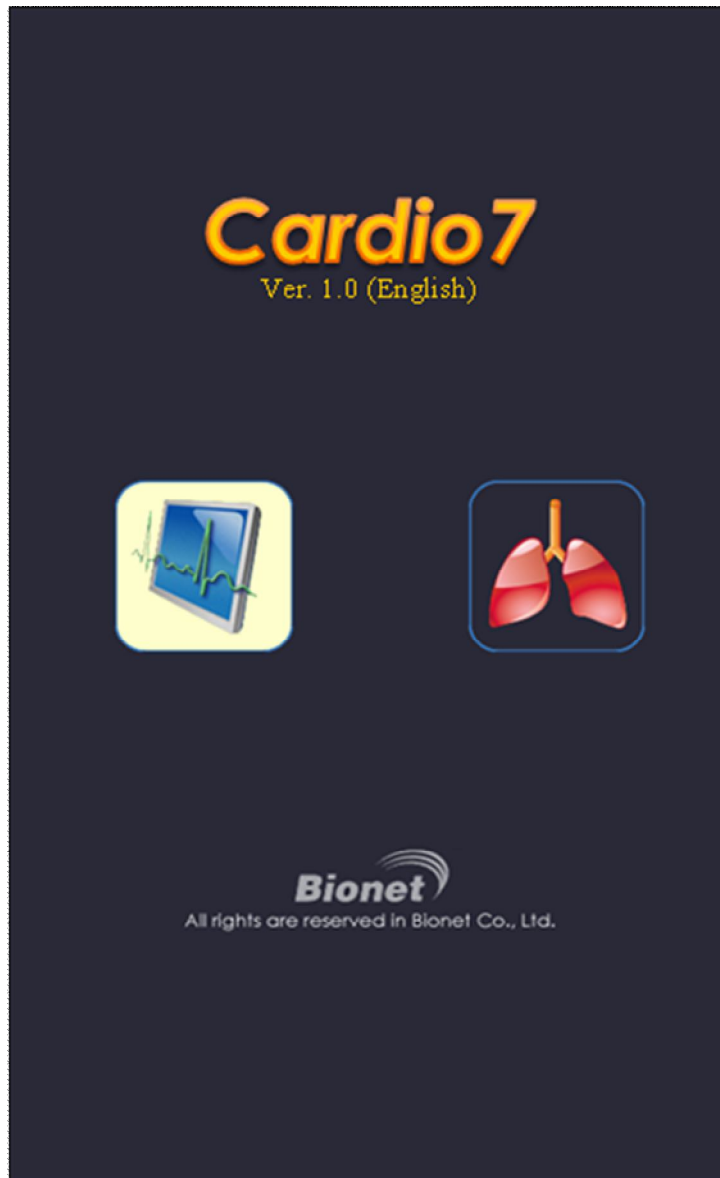
- Connect the patient cable to the patient cable connection port on the right side of the body.
- Connect limb electrodes to RL(N), LL(F), RA(R), and LA(L) lead of the patient cable and chest electrodes to V1(C1), V2(C2), V3(C3), V4(C4), V5(C5), and V6(C6), respectively.

Paper Installation

- Push the printer cover-opening button to the rightward to open the printer door of Cardio7. Install EKG paper with the side to be recorded appear on top. Close the cover to finish paper installation process.

System Start

- After all installation processes are finished, turn on the power switch to see Cardio7 Logo, system firmware version, the company name, and icons for ECG or Spirometer mode displayed on the LCD screen.



- To select ECG mode, locate selection box on ECG and press the rotary key or touch the selection box on the screen.

5) System Setup

Reset

Press VIEW key on the control panel for more than three seconds to initialize all the system setup into the factory mode. In three seconds, the following messages are displayed for a second and reset starts. At this time, please note that all saved data will be deleted by this setting.

SYSTEM MESSAGE
Factory Default Setting Loading...

* Defaults are as follows.

Sensitivity (SENS)	10mm/mV
Printing speed (SPD)	25mm/s
Grid (GRID)	Off
Channel form (FORM)	6ch+1rhy
Rhythm channel (RHY)	CH1 : II, CH2 : V1, CH3 : V5
Base Line filter (BASE)	On
EMG filter (MUSC)	Off
Power noise filter (AC)	60Hz when ENG, ENG_US setting 50Hz for other languages
Low pass filter (LPF)	40hz
Diagnosis (Diagnosis)	On
Stored Data (List)	Delete
Pace Maker (P/M)	Off
Lead Fault (L/F)	On
Unit Setting(unit)	cm/kg
Beat form	On
Monitoring Form	Continue
QRS Sound	Off
File Save	Off
Printer Line	Normal

Chapter 2. Preparation for Electrocardiography

1) Location of Electrode

2) Electrode Connection

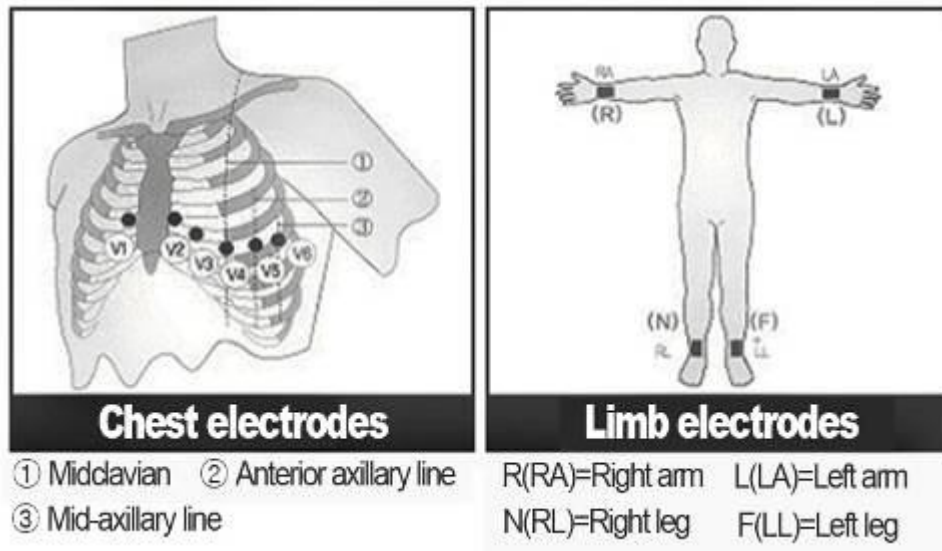
Patient Cable Connection

How to attach Electrodes

Countermeasures for Bad Lead Connection

1) Location of Electrode

Attach electrodes to the patient's body to record an electrocardiogram of twelve standard leads [I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6], as shown below.



Limb electrodes are located as follows.

- RL (N) : Right leg
- LL (F) : Left leg
- RA (R) : Right arm
- LA (L) : Left arm
- V1 (C1) : Fourth intercostal space at the right border of the sternum
- V2 (C2) : Fourth intercostal space at the left border of sternum
- V3 (C3) : Midway between location V2 and V4
- V4 (C4) : At the mid-clavicular line in the fifth intercostals space
- V5 (C5) : At the another axillary line on the same horizontal level as V4
- V6 (C6) : At the anterior axillary line on the same horizontal level as V4 and V5

2) Electrode Connection

* Check points

Check the status of equipment and attachment patient's body before measuring.
Check any mechanical danger.
Check cables and accessories connected to the outside.
Check all the devices to measure a patient.

Patient Cable Connection

Connect the patient cable to the patient cable port of the right side of Cardio7.

How to Attach Electrodes

Attach electrodes after placing a patient on the bed, helping him/her to be relaxed and cleaning electrode contact points on the patient's skin by using a disinfective alcohol or water. When it is difficult to attach electrodes due to excessive hair or bent shape, apply ECG gel. Finally, attach leads to the parts as explained in aforementioned "location of electrode" part.(Please refer to the page 28)

ECG gel should be kept moist during measurement. If ECG gel is hardened, it will create a lot of noise in the signal. Wipe out any excess gel once the measurement is finished.

Caution

Use only electrodes and patient cables provided from Bionet Co., Ltd. Bionet Co., Ltd. will take no responsibility for any accidents involving 3rd party accessories.

Countermeasures for Bad Lead Connection

After tuning on power switch, enter ECG mode to check waveforms of all leads. On this menu, operators can check waveforms of all leads and their noise, and may see "Lead Fault" message displayed on LCD screen.

NOTE

- Message will be displayed when L/F is set to ON in System Setup, and will NOT be displayed When set to OFF.
- "Lead Fault" message will appear, and a buzzer alarm will go off when lead fault occurs during printing.

Lead Fault! All Leads.

Following two cases could cause a lead fault error.

- First case, leads are detached from the patient's body. In this case, re-attach leads normally.
- Second case, signal conductivity between leads and the patient's body is low. In this case, apply ECG GEL or water on the lead and re-attach leads normally.

If two above cases have been performed and the operator is still experiencing noise or Lead Fault conditions, PATIENT CABLE may be faulty. Please contact Bionet service center.

Chapter 3. Electrocardiography

1) To Start

2) Basic Setup

- General
- Sensitivity Setup
- Printing speed Setup
- Channel form Setup
- Grid On/Off
- Rhythm Printing Setup
- Beat Report Setup
- Diagnosis Printing Setup
- Rhythm Lead
- Patient Information Input
- Pediatrics Diagnosis

3) LCD Monitor Display

4) Rhythm Mode Printing

- Printing Speed
- How to Print

5) Record Mode Printing

- 10 seconds ECG recording
- 60 seconds ECG recording
- 5 minutes ECG recording

6) Printing Form

7) Copy Mode Printing

8) Device Setup

Basic Setup




Network Setup

Hospital Setup





9) Network Functions

10) Data Management

1) To Start

- . Connect leads to the patient, and then turn on the device in accordance with the preparation steps for measuring electrocardiogram in Chapter 2.
- . Set up filter, sensitivity, printing speed, channel form, and rhythm settings in accordance with the steps shown in "Basic Set-Up" in Chapter 3.
- . Enter the patient information in accordance with the steps of "Basic Setup" in Chapter 3.
- . If the waveform displayed on LCD is abnormal or has excess noise, follow the instruction of "Countermeasures by Bad Lead Connection" in Chapter 2.
- . If the waveform displayed on LCD is normal, press REC key to record the electrocardiogram of the patient.
- . To copy the same report as the previously printed report, press COPY  key
- . To do monitoring signal by printer, press RHYTHM  key
- . To stop the machine during the printing or saving processes, press STOP  key

Following buttons will be most commonly used when operating Cardio7 .

	Rhythm Printing: Pause monitoring on LCD display, and print real-time waveform using printer. Can get either continuous or A4 sized EKG rhythm printouts
	Diagnostic Printing: Record 10 seconds of data starting from button press. Then the device will extract important parameters for diagnosis and print the summary on an A4 sized printout.
	Copy Printing: Used when printing the previously printed diagnostic reports of 10-second data same, or printing the data with different parameters such as filter, wave sensitivity, printing speed, channel mode, etc.
	Pause: Used when cancelling execution, returning to previous mode when entering main menu or pausing printer during printing.

2) Basic Setup

General

When the device is on, the current configuration values of the system will be shown on LCD in the order of the heart rate, patient information, time, battery status, sensitivity, printing speed, application of the base line filter, application of the electromyogram filter, printing channel configuration, and selection of the rhythm lead.

These configuration values can be changed using either a rotary key or touch screen. With the rotary key, the desired menu and changed configuration values can be set easily.

Same functionality can also be achieved with the touch screen by pressing and changing the desired information on the LCD.

1. Changing the configuration value with the rotary key

In this case, please follow these four steps; enter Menu Mode, navigate and select Menu and then change values.

- Entering Menu Mode: Operate by rotating the rotary key clockwise or counter-clockwise.
- Menu Navigation: Operate by rotating the rotary key. Menu movement will occur in the same direction as direction of the key's rotation.
- Menu Selection: Initiate by pressing the rotary key. Menu box for setting of the selected menu will be displayed.
- Modifying setting values: Move to desired setting, then modify & select values in the same manner as menu movement shown above. If there are any previously set values, setting menu box with the previous value will appear. If there are no OK buttons, setting menu will automatically close and return to setting menu display. If there are a lot of setting values, enter them all then click on OK button to indicate data entry is complete to close menu box.

2. Changing the setup value with the touch screen

You select Menu and change the setup value.

① Select Menu: You could select the menu by touching on the screen. Unlike the Rotary Key, the setup box appears when you select Menu.

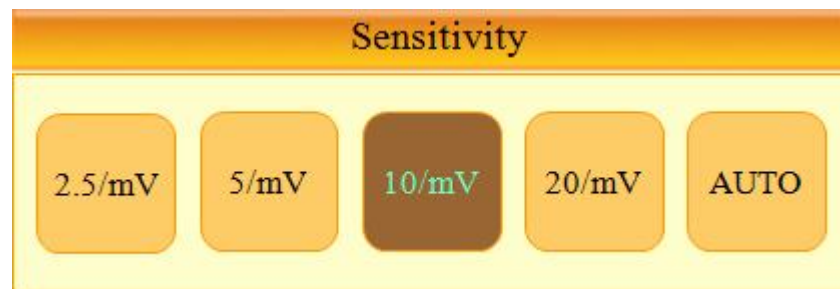
② Change the value: You need to touch the item on the screen to select.

(In the event of system configuration, you should use only the Rotary Key to set up a value.)

Sensitivity Setup

This is a functionality that can modify sensitivity of the output signal, when the outputting signal's amplitude is too large to cause overlap with neighboring signal, or too small so that signal diagnosis is difficult.

Users can set all 12 channels to 2.5mm/mV, 5mm/mV, 10mm/mV or 20mm/mV. Users can also set it to Auto which will automatically set sensitivity level for five channel; for example I, II, III, aVR, aVL, aVF to 10 mm/mV and V1, V2, V3, V4, V5, V6 to 5mm/mV. Note that 10mm/mV means printing 1mV signal as 10mm in amplitude on the printing paper.



To change the sensitivity of the signal, select and enter wave amplitude menu on the main display (⏏) using the rotary key or touch screen, and open setting menu display shown above. After then, using the rotary key to select desired sensitivity level and press down to enter or select it using touch screen to set the size of waveform displayed on screen.

Selected values are shown on the bottom of EKG printouts in the following way; when '2.5', '5', '10' and '20' are selected, they will be displayed as '2.5mm/mV', '5.0mm/mV', '10.0mm/mV' and '20.0mm/mV'; when Auto is selected, sensitivity level will be printed as '10.0/5.0mm/mV'.

Left side of graph display will show channel name and a bar graph, so users can notice recently changed values easily. (For 20mm/mV, only one bar graph will appear so that overlapping of indicators does not occur.)

NOTE

- If it is set to 5min recording mode, it will print out as 5.0mm/mV.

Printing speed Setup

This is the function used to adjust the width of the signal displayed. Three values, 12.5 mm/s, 25 mm/s, and 50 mm/s are available for adjustment. 25 mm/s means to record the signal of the electrocardiogram for a second on 25 mm. Therefore, the width of 12.5 mm/s is a half of the width of 25 mm/s, and the width of 50 mm/s becomes two times of the width of 25 mm/s. If you want to record the broad width of the signal, set up the higher value.



To modify EKG waveform's printing speed, place selection block to speed information menu (F1) by rotating the rotary key, then press it to select or touch the speed information menu directly. Above 'Printing Speed' menu will be shown. Select desired speed using the rotary key or touch screen. Set value will be displayed on the bottom of printout form as 12.5mm/s, 25mm/s or 50mm/s. Note that if the user wishes to print in A4 size, set the printing size to 25mm/s.

NOTE

- If it is set to A4 size at monitoring mode, output speed is 25mm/s.
- If it is set to 5min recording mode, it will print out as 12.5mm/s form.

Channel Form Setup

Select channel form setting of Printing Form. Currently 6 types of channel forms (3ch+1rhy, 3ch+3rhy, 6ch+1rhy, 12ch rhy, 60s 1rhy and 5m 1rhy) are offered in Cardio7.



To select printout channel form settings, place selection block to print setup menu (F2) and press down using the rotary key or touch screen input to select desired channel forms in printing form menu.

Set values will be printed on top of the printout form as; when it's '3ch+1rhy', it will show '3 Channels + 1 Rhythm Report'; when it's '3ch+3rhy', it will show '3 Channels + 3

Rhythm Report'; when it's '6ch+1rhy', it will show '6 Channels + 1 Rhythm Report'; when it's '12ch rhy', it will show '12 Channels Rhythm Report'; when it's '60 sec 1rhy', it will show '1 Channel Rhythm Report(60 sec)'; when it's '5 min 1rhy', it will show '1 Channel Rhythm Report(5 min)'.

- 3ch+1rhy mode will be showing a 10-second EKG recording with channels I, II, III for the first 2.5 seconds, aVR, aVL, aVF for the next 2.5 seconds, V1, V2, V3 for the following 2.5 seconds then V4, V5, V6 for the final 2.5 seconds. Additionally, it will display rhythm of selected 1 lead on the bottom for 10 seconds.

- 3ch+3rhy mode will be showing a 10-second EKG recording with channels I, II, III for the first 2.5 seconds, aVR, aVL, aVF for the next 2.5 seconds, V1, V2, V3 for the following 2.5 seconds then V4, V5, V6 for the final 2.5 seconds. Additionally, it will display rhythms of selected 3 leads on the bottom for 10 seconds.

- 6ch+1rhy mode will be showing a 10-second EKG recording with channels I, II, III, aVR, aVL, aVF for the first 5 seconds, then V1, V2, V3, V4, V5, V6 for the last 5 seconds. Additionally, it will display rhythm of selected 1 lead on the bottom for 10 seconds.

- 12ch rhy mode will record 10-second EKG measurements of all 12 leads in the order of channels I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6.

- 60 sec 1rhy mode will record EKG of selected 1 lead for 60 seconds with 6 lines of 10-second long measurements.

- 5 min 1rhy mode will record EKG of selected 1 lead for 5 minutes with 15 lines of 20-second long measurements.

Rhythm Printing Setup

Under rhythm printing mode, user can set whether printout will be done continuously or fit in A4 size (10-second EKG recordings). Rhythm printout setting can be set using printing form mode. Under Mon menu, use rotary key or touch screen to select between A4 or Continuous options.

The image shows a 'Printing Form' screen with a yellow background and orange borders. At the top, the title 'Printing Form' is centered in a yellow box. Below the title, there are several buttons and indicators:

- REC 6CH + 1**: A button with 'REC' in black and '6CH + 1' in red below it.
- MON CONTIN**: A button with 'MON' in green and 'CONTIN' in black below it.
- CONTIN A4**: A button with 'CONTIN' in white and 'A4' in black below it.
- Beat OFF**: A button with 'Beat' in black and 'OFF' in red below it.
- Diag. ON**: A button with 'Diag.' in black and 'ON' in red below it.
- OK**: A button at the bottom center with 'OK' in black.

Grid on/off

Printing grid may be needed when a fax paper is used instead of EKG paper for printing. For grid line will be shown for every 5mm X 5mm space and dots for every 1mm X 1mm space. If EKG paper(thermal paper) supplied by Bionet is used, Grid option should be turned off as it already contains grid on paper.

Grid option could also be set on Printing Form menu. In Grid menu, use rotary key or touch screen to change grid option between ON and OFF. When Grid option is set to ON, grid will be printed out, and no grid printout for OFF.



Beat Report Setup

During diagnostic print, set output of the representative beat information. Beat report is added to regular printout (3ch+1rhy, 3ch+3rhy, 6ch+1rhy and 12ch rhy output), and has "Representative Beat Report" printed on the upper part of the printout form. This Beat report has representative waveforms of each lead and shows any important parameters calculated from recordings.

In Beat menu under Printing Form menu, use the rotary key or touch screen to select between ON and OFF to turn the option on or off. ON will cause Beat report to be printed and OFF to disable beat report printing. However, at 60sec and 5min recording mode, Beat Report is not printed.



Diagnosis Printing Setup

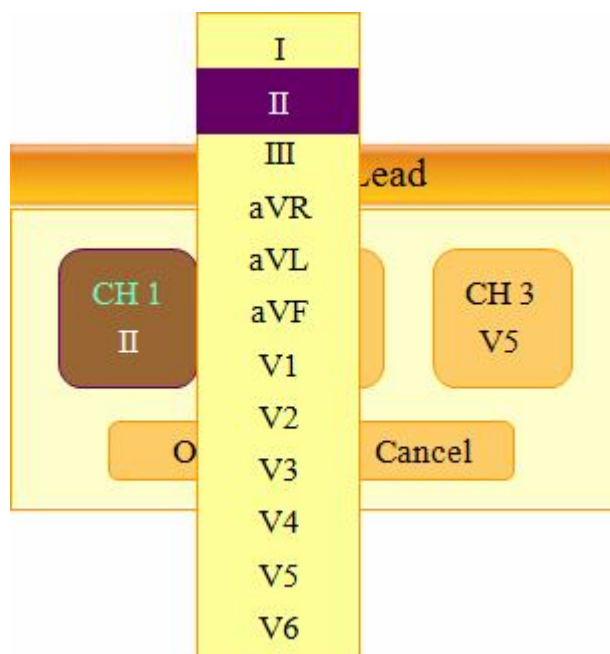
Under diagnosis printing mode, users can set whether diagnosis results will be printed alongside waveforms. Diagnosis printing can be turned ON or OFF in Printing Form setting under 'Diag' menu. ON sets diagnosis results to be printed and OFF disables diagnosis printing.



Rhythm Lead

To select Rhythm Lead, move selection block to Rhythm Lead setting (ⓘ) located bottom of the screen and select using either the rotary key or touch screen to enter Rhythm Lead setting. In Rhythm Lead setting, select desired channel, then select the desired rhythm lead using the rotary key or touch screen.

Lead selected from channel 1 will become the base lead in '3ch+1rhy' and '6ch+1rhy' modes, showing on the bottom of the printout form. It will also be used in '60 sec 1rhy' and '5 min 1rhy' modes as the only lead being recorded and printed. For '3ch+3rhy' mode, lead selected under channels 1, 2 and 3 will be printed on the bottom of the printout and become the base rhythm for other channels.



Patient Information Input

In this menu, operators can input patient's ID, name age, sex, height, weight, race and smoking habit. In order to enter patient information, move selection block to Patient Information Input setting (👤) and select input fields using either the rotary key or touch screen.

Patient Information

ID

Name

Age

Gender Male

Height cm

Weight kg

Race Oriental

Smoke No

OK
Cancel
New

〈Patient Information Selection Mode〉

Information input mode will be displayed after selecting the value to enter using

either the rotary key or touch screen. Use the rotary key or touch desired values on the screen to enter information. Input mode includes Keyboard for both characters and numbers and Keypad mode for just numbers only. On values where only number should be entered, users will see keypad will appear instead of regular keyboard input..

Edit ID

1	2	3	4	5
6	7	8	9	0
q	w	e	r	t
y	u	i	o	p
a	s	d	f	g
h	j	k	l	”
z	x	c	v	b
n	m	<	>	?
SFT	CAP	SPACE	←	OK

〈Information Input Mode〉

Edit Age		
7	8	9
4	5	6
1	2	3
.	←	0
OK		

〈Information Input Mode〉

Pediatrics Diagnosis

Pediatrics diagnosis is supported for patients with ages of between 3 and 15 years old. When entering patient information, if the input age entered by operator in 'Age' section falls between 3 to 15 years old, the device will automatically apply pediatrics diagnosis. If the patient is 16 years old or older, the device will perform regular (adult) diagnosis instead.

3) LCD Monitor display

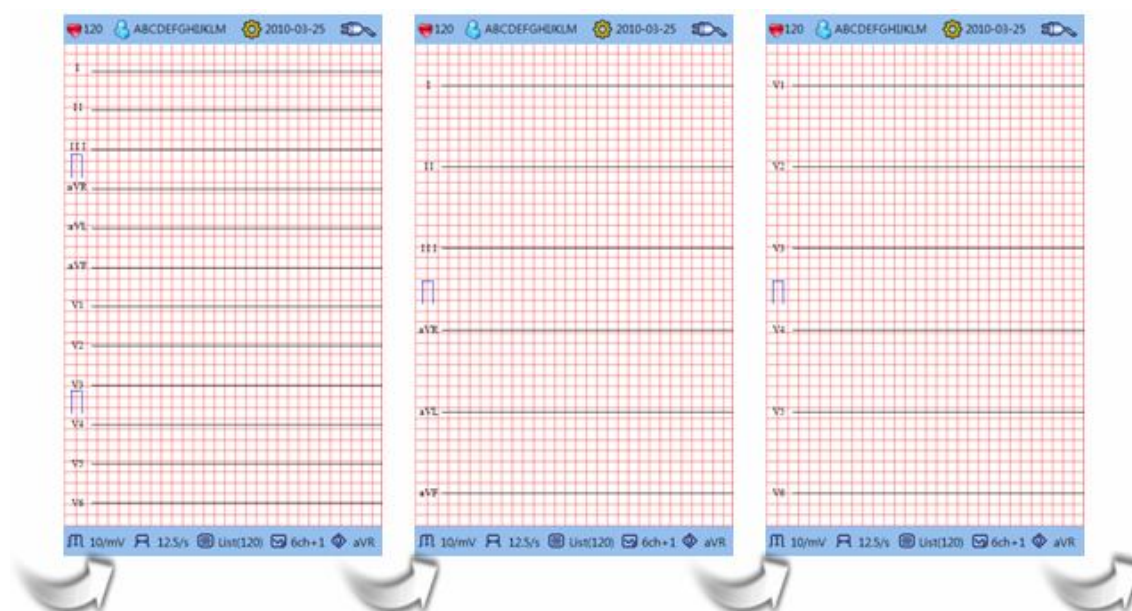
Monitor mode display shows the currently measured electrocardiogram signal in real time. The monitor mode display function is used for the following two purposes. One is to check whether the signals from the all channels are coming out properly. The other one is to see the status of the electrocardiogram of the patient for a long time

Filters for the monitor mode display are below. (Setup in System setup)

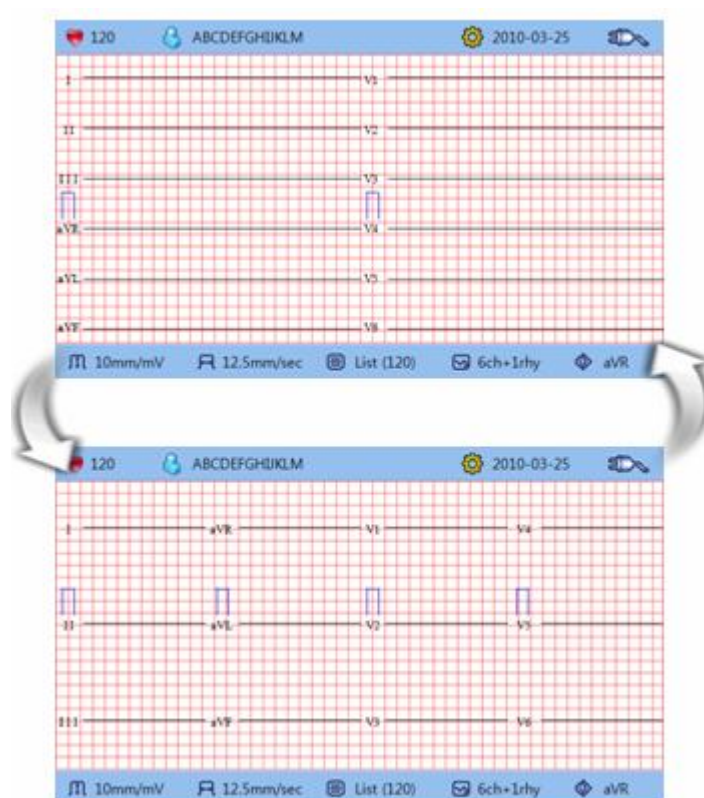
BASE LINE	On(fixed)
Electromyogram Filter(EMG)	Off(fixed)
Power Supply Filter(AC)	Option
Low Pass Filter(LPF)	40hz(fixed)

The printing speed can be selected to 12.5 mm/s, 25 mm/s, and 50 mm/s, and the sensitivity can be selected to 2.5 mm/mV, 5 mm/mV, 10 mm/mV, 20 mm/mV, and Auto.

Display output can either be done in portrait or landscape views. If it's in portrait mode, press VIEW (⦿) key to switch viewing mode. There are total 3 different viewing modes; display all 12 leads and two displays each showing 6 leads. Following diagram shows display switch order with arrows indicating each press of VIEW key.



In the landscape mode, there are total two display options with either 2 6-lead columns or 4 3-lead columns. Following diagram shows display switch order with arrows indicating each press of VIEW key.



Note

Display output mode can be set in Basic Setup under Device Setup menu.
(Please refer Device Setup (Please refer to page 61))

* Displayed heart rate number uses averages between 4 heartbeats recorded

4) Rhythm Mode Printing

In rhythm mode printing, the measured ECG signals would be printed in real-time. Rhythm mode printing allows operators to perform following two functions; one is to verify that signals in all channels are active before recording ECGs, and another is to print the ECGs rhythm status of the patient for a longer duration.

In this rhythm mode, filter setting is fixed as follows;


BASE LINE	On(fixed)
Electromyogram Filter (EMG)	Off
Power Supply Filter (AC)	Option
Low Pass Filter (LPF)	40hz

Printing Speed


Printing speed can be set to 12.5 mm/s, 25mm/s, 50mm/s and signal level can be set to 2.5mm/mV, 5mm/mV, 10mm/mV, 20mm/mV, and Auto.

(In rhythm mode printing, it prints only to 25mm/s if you select the A4 printing.)

How to Print

Filter setting value is fixed. Set the required printing speed and sensitivity and press RHYTHM () key. Then, the system starts printing according to the selected speed with the following message on the LCD.

SYSTEM MESSAGE
Printing..


Press () key to stop printing EKG rhythm. After pressing the key, the system will stop printing and display system setting after indicating following message for 1 second on the LCD.

SYSTEM MESSAGE
Process Canceling...

5) Record Mode Printing

For the record mode display, save the electrocardiogram in the memory first, and apply the filter which is set up by the user to the saved electrocardiogram, and then extract the parameters for the heart rate, PR interval, QRS duration, QT/QTc, and P-R-T axes. Then print out the heart rate according to the sensitivity, printing speed, and channel form that are set up by the user.

10 seconds ECG recording

When one of 3ch+1rhy, 6ch+1rhy, 12ch rhy, and beat is selected for the channel form, press RECORD () key to display the saving time as below and save the 10-second data to the memory.




When the 10-second data saving is completed, the following message will be displayed on the LCD screen and the setup filter will be applied to the saved data. After then the parameters that required for the diagnosis will be extracted from the data.



When the data processing is completed, the following message will be displayed on the LCD screen, and then the printing will start.




Press ESC () key to stop and exit while saving data or printing EKG. Once saving or printing stops, following message will be displayed on the LCD screen for one second, followed by the initial screen.

SYSTEM MESSAGE

Process Canceling...

60 seconds ECG recording

When the channel form is set to 60 sec 1rhy, pressing RECORD () key will make the device to record EKG data, while printing record duration for 60 seconds on a predetermined rhythm channel.

SYSTEM MESSAGE

***Record 60 seconds ***

35

Once EKG recording is done, following message will appear on the LCD display while recorded data is filtered and processed to acquire the heart rate.


SYSTEM MESSAGE

Data Processing...

After data processing is finished, following message will appear on LCD screen, followed by printing of the recorded signal

SYSTEM MESSAGE

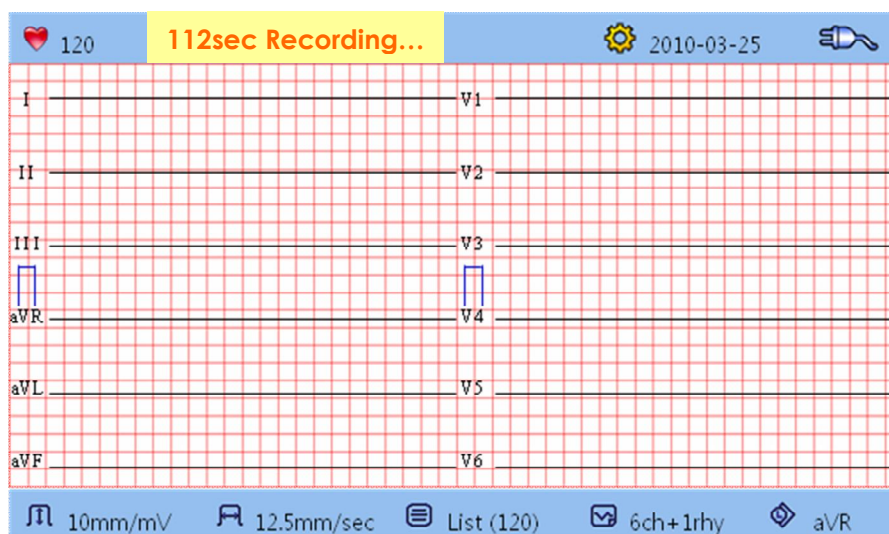
Printing...


Press PAUSE () key to pause or exit during data saving or printing. After pressing the key, following message will be displayed on the LCD screen for 1 second, then saving or printing will stop.

SYSTEM MESSAGE

Process Canceling...

5 minutes ECG recording




When the channel form is set to 5 min 1rhy , pressing RECORD () key will make the device to record EKG data, while printing record duration for 5 minutes on a predetermined rhythm channel. If the channel form is set to 5minutes ECG, regardless for printing size and speed setting, sensitivity and printing speed will be 5mm/mV and 12.5mm/s.

Once EKG recording is done, following message will appear on LCD screen, followed by printing of the recorded signal

SYSTEM MESSAGE

Printing...

Press PAUSE () key to pause or exit during data saving or printing. After pressing the key, following message will be displayed on the LCD screen for 1 second, then saving or printing will stop.

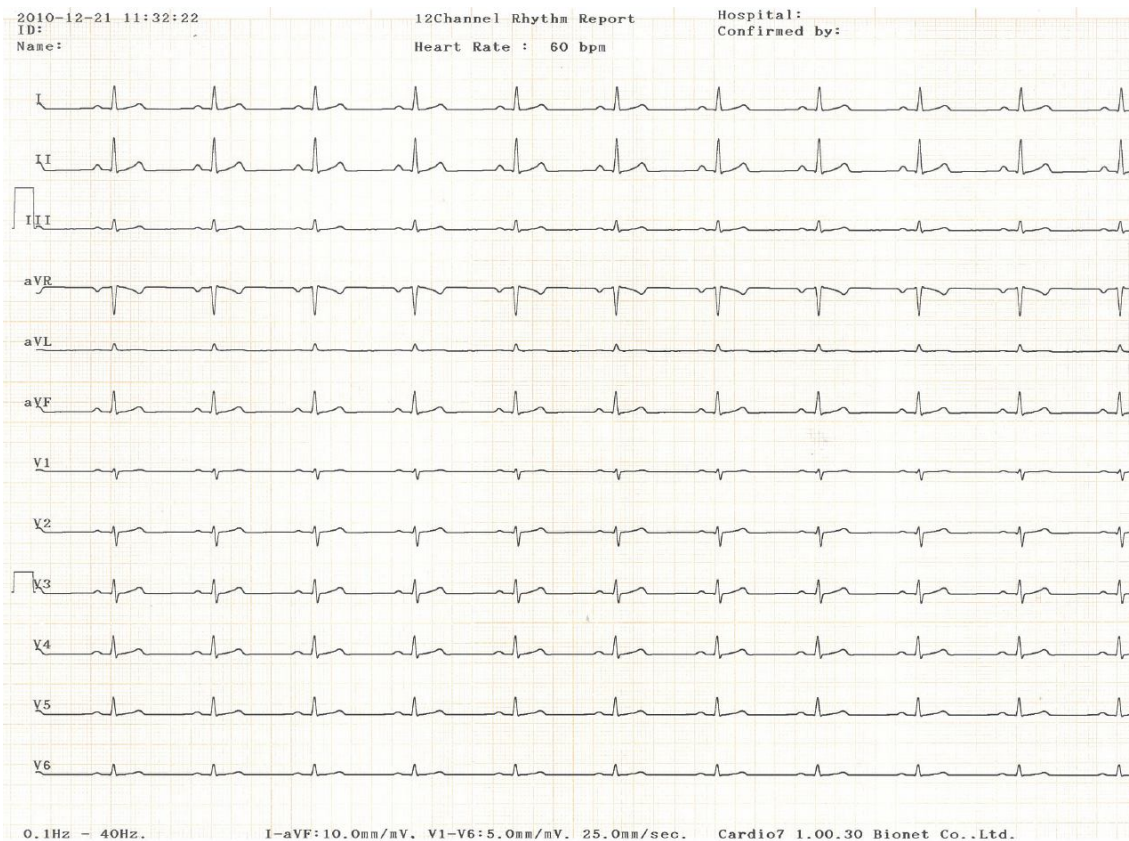
SYSTEM MESSAGE

Process Canceling...

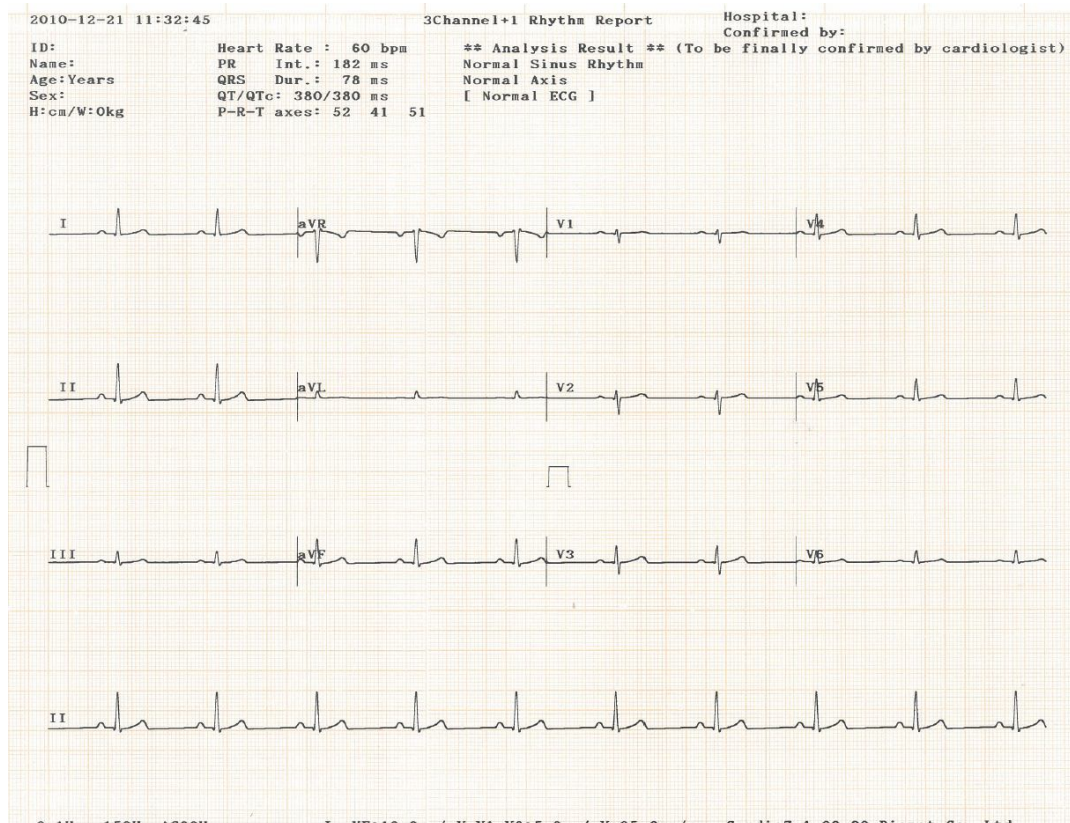
6) Printing Form

In this section, descriptions and samples of various printing forms are provided.

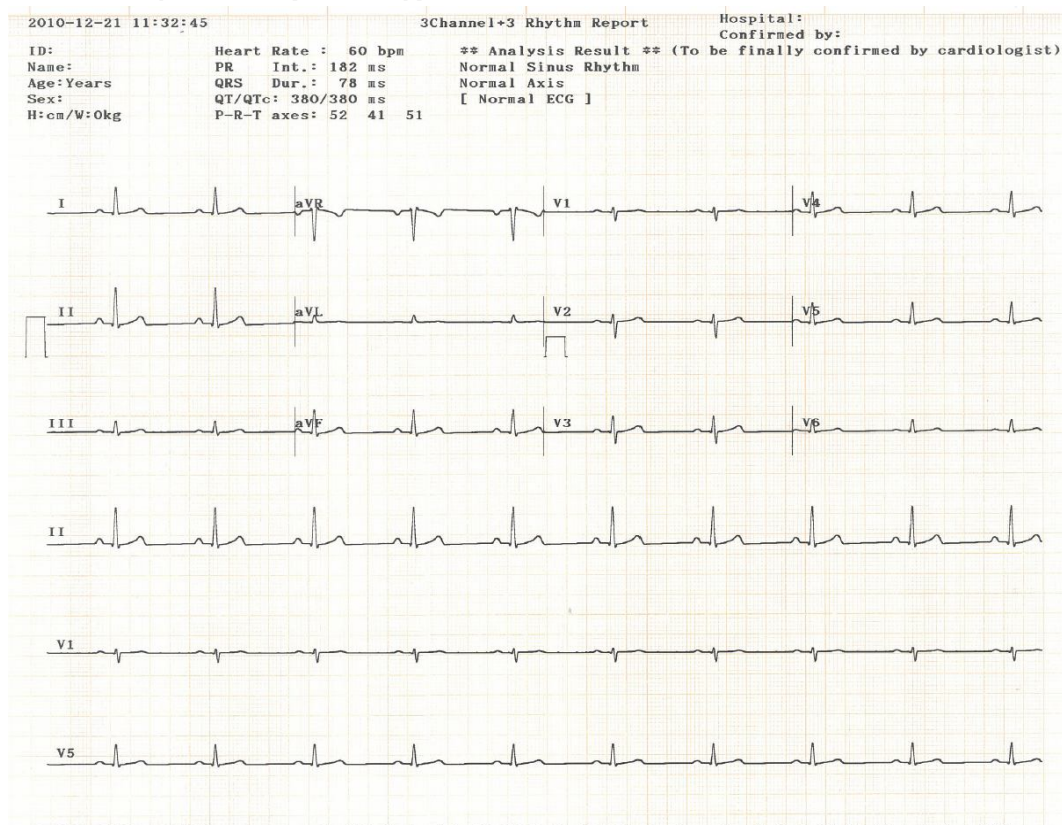
Rhythm Report Form



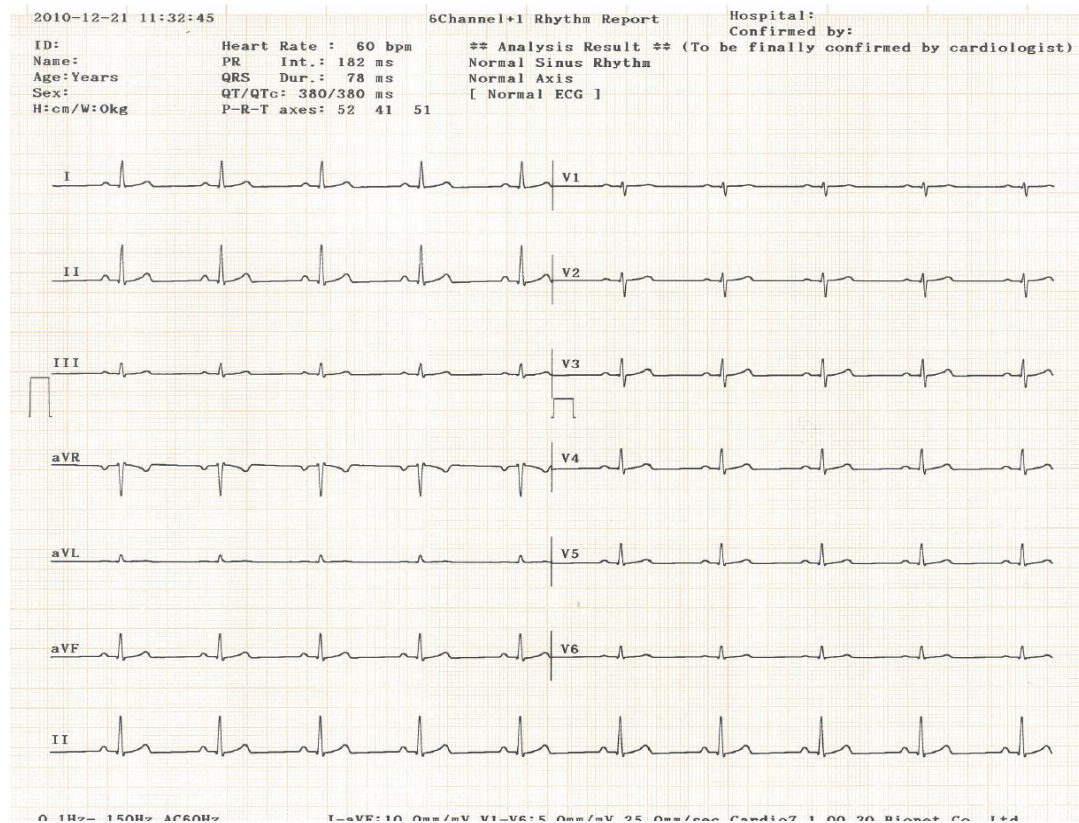
- Record Report Form (3ch+1rhy)



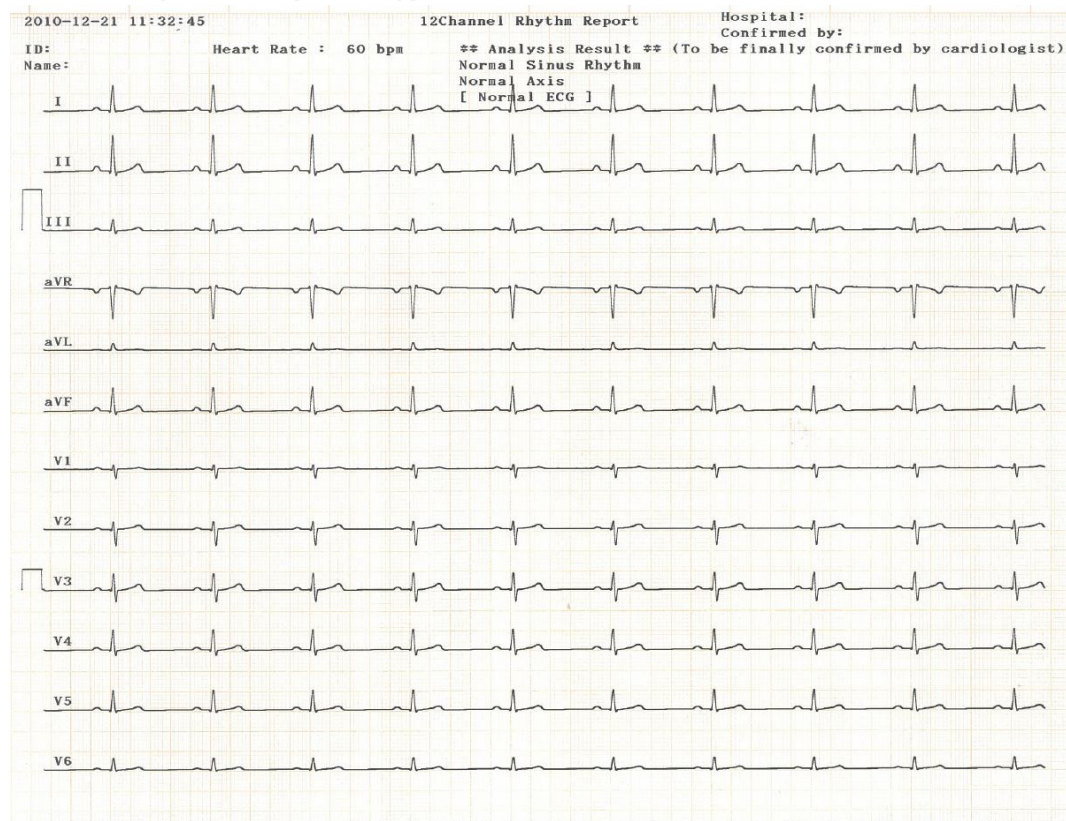
- Record Report Form (3ch+3rhy)



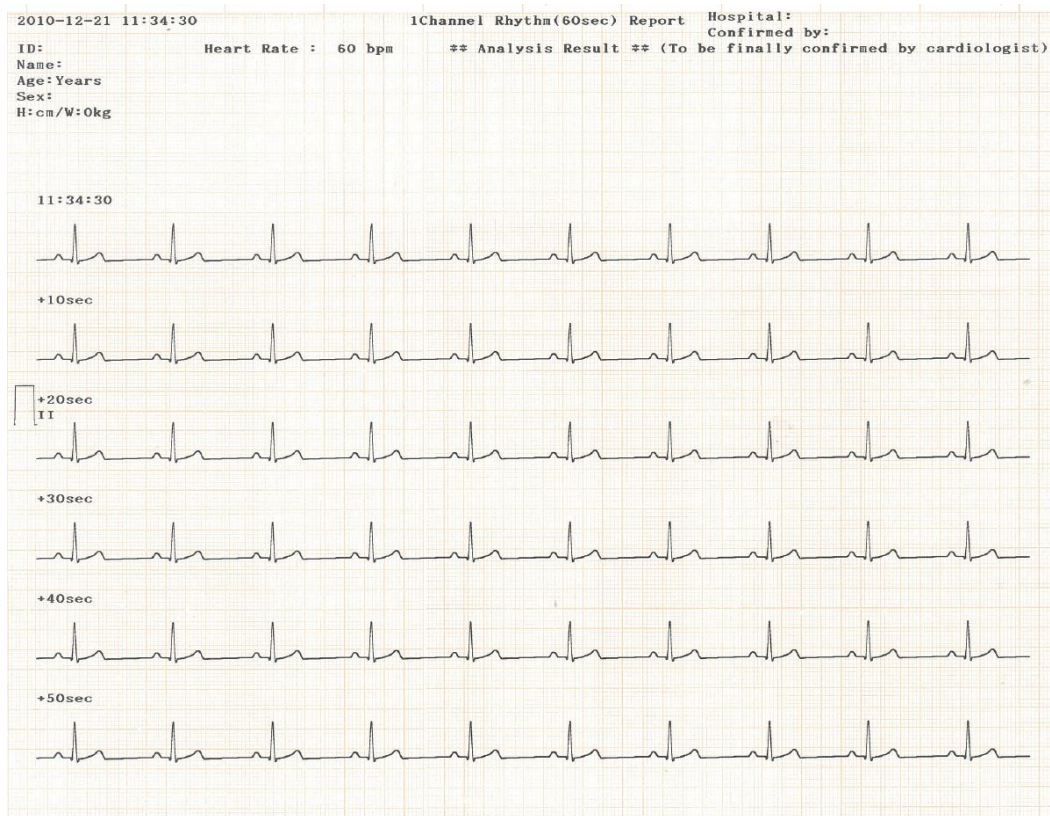
- Record Report Form (6ch+1rhy)



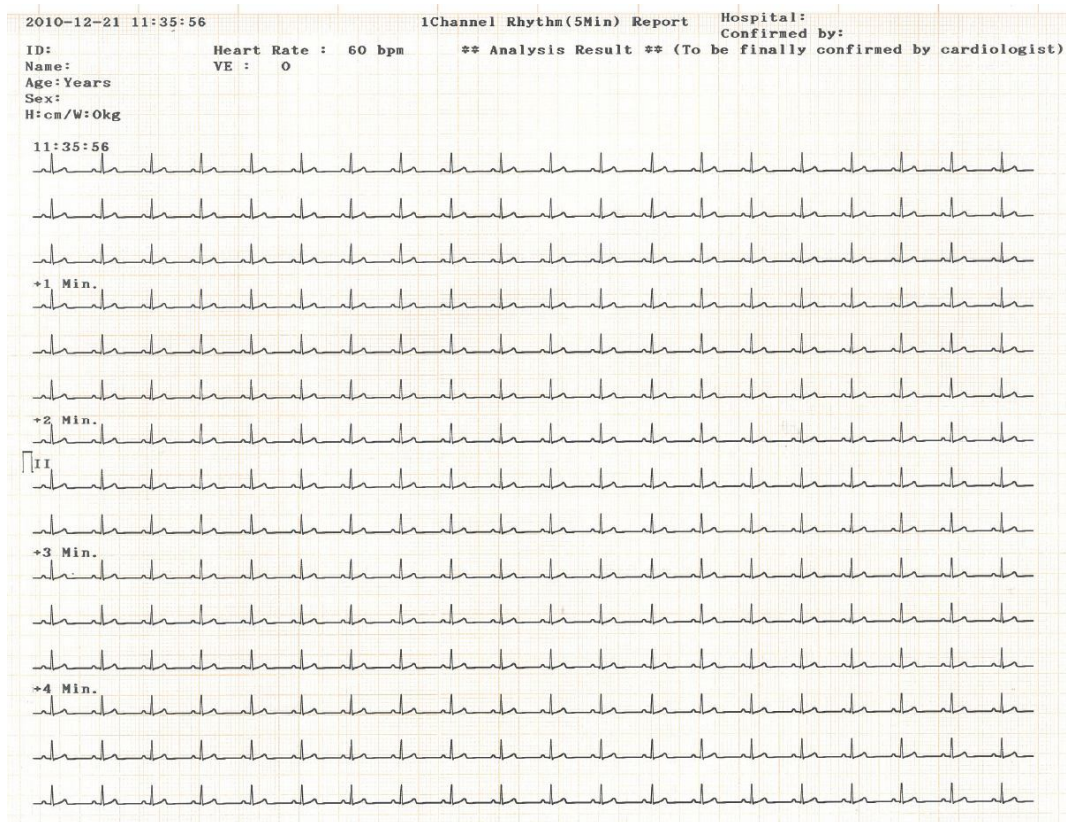
- Record Report Form (12ch rhy)



- Record Report Form (60 sec. 1rhy)

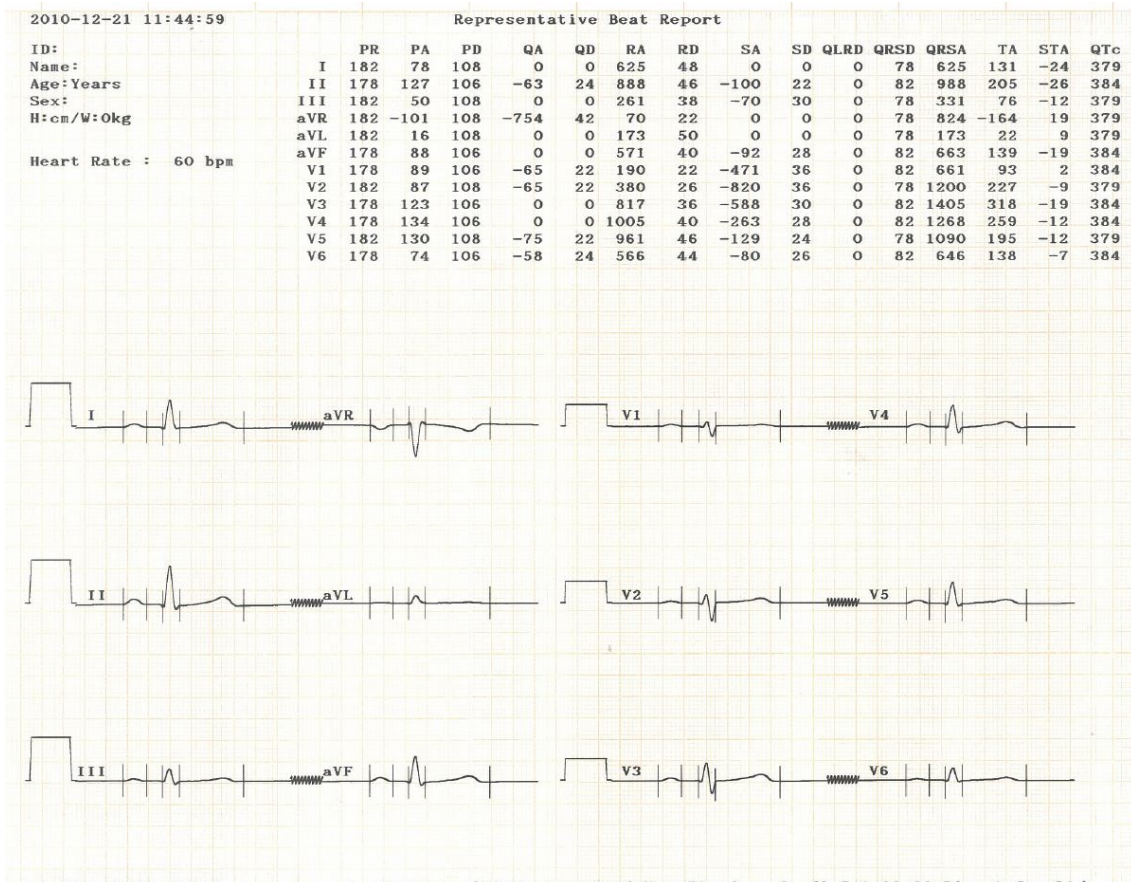


- Record Report Form (5 min. 1rhy)

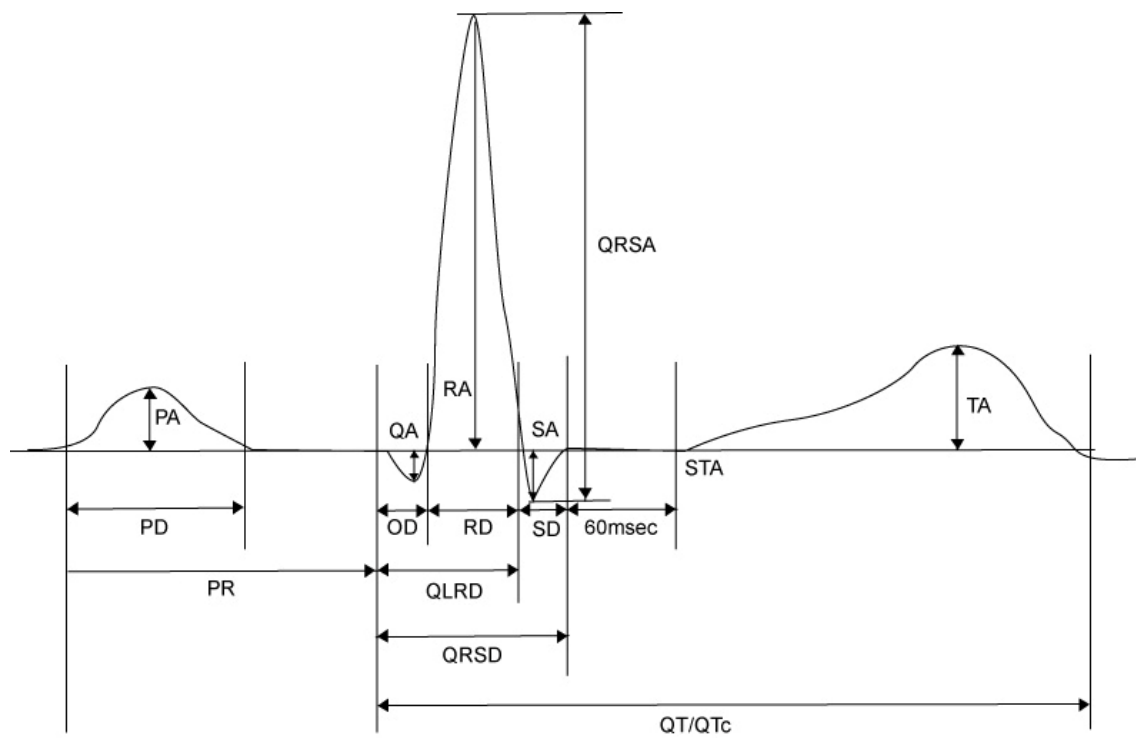


- Record Report Form (Beat Report)

Cardio7 Operation Manual



* Beat Report Parameters



PR : PR Interval
 PA : P Amplitude
 PD : P Duration
 QA : Q Amplitude
 QD : Q Duration
 RA : R Amplitude
 RD : R Duration
 SA : S Amplitude
 SD : S Duration
 QLRD : Duration between Q and Last R
 QRSD : QRS Duration
 QRSA : QRS Amplitude
 TA : T Amplitude
 STA : ST Amplitude
 QTc : collect Q-T Interval

7) Copy Mode Printing

Copy Mode Printing is a function to print out the same report as the previously printed report. In Copy Mode, users can also print out the same previous data but with changed settings such as filter type, sensitivity, printing speed, channel form, and rhythm number if more than one rhythm is recorded.

Copy Mode can be entered by pressing COPY (Ⓢ) key following an EKG recording. After pressing COPY Key, following message will be displayed on the LCD screen, and the printing process will start.



If Copy Mode Printing is called without performing an EKG recording, there would be no EKG data to copy. In this case, the following message box will be displayed for 1 second, followed by the setup status of the system being displayed.



Note
If recording mode changes to 60-second or 5-minute after 10-second recording, the device will consider as no data since the recorded data size is smaller than set mode.

If you change the filter setup from the previously saved EKG data, the following message will be displayed with the changed filter being applied.



When the filter application is completed, the following message will be displayed, and the printing process will start.

SYSTEM MESSAGE

Printing...

If the device encounters a problem before it finishes printing, following message will be displayed for 1 second before returning to previous menu.

SYSTEM MESSAGE

Abnormal End!

Press the PAUSE (⏸) key in order to abort the printing, Once printing is stopped, the following message will be shown for one second on the LCD screen before returning to previous menu.

SYSTEM MESSAGE

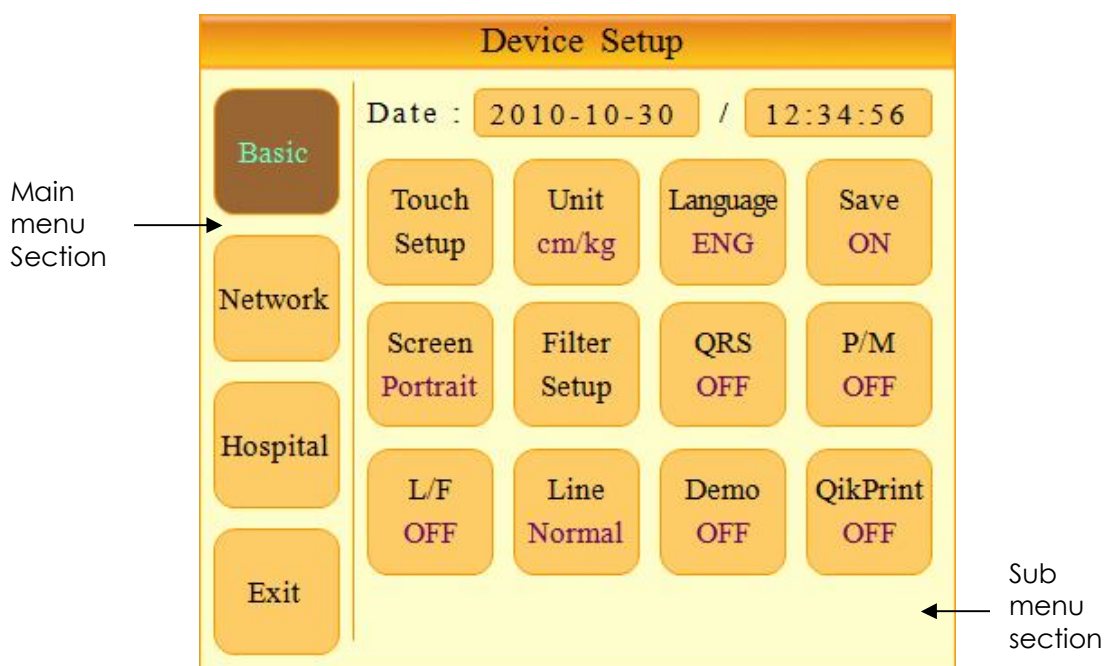
Process Canceling...

8) Device Setup

Device Setup consists of 'Basic Setup', 'Network Setup' and 'Hospital Setup' main menus. Preferences for each main menu item can be set by navigating menus representing each section. Upon entering Device Setup Menu, users will see 'Basic Setup' menu highlighted. After selecting preferences for all desired sections, press 'OK' button to apply and 'Cancel' button to abandon the setting. To exit from Device Setup, press 'ESC' key on the control panel or select 'Exit' section.

Basic Setup

Basic Setup consists of Date, Time, Touch screen (Touch Setup), Unit, Language, Save, Screen, Filter, QRS, P/M, L/F, Line, Demo and QikPrint menus. Use rotary key or touch screen to select a desired menu item, which would then open its submenu to allow the user to enter desired input values.



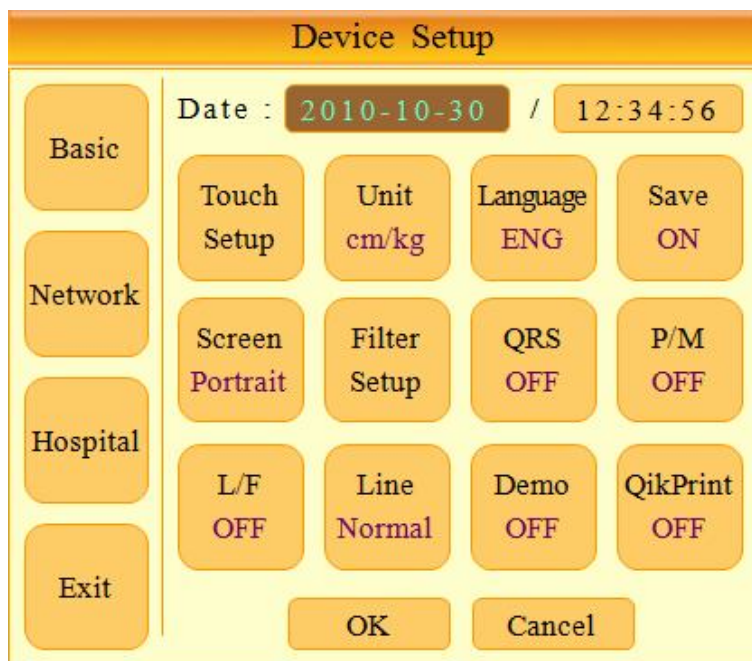
To save modification after setting values in each submenu, select OK. To abandon changes, select Cancel.

After selecting either OK or Cancel, the screen will go back to Device Setup view.

ESC () key will function same as Cancel button.

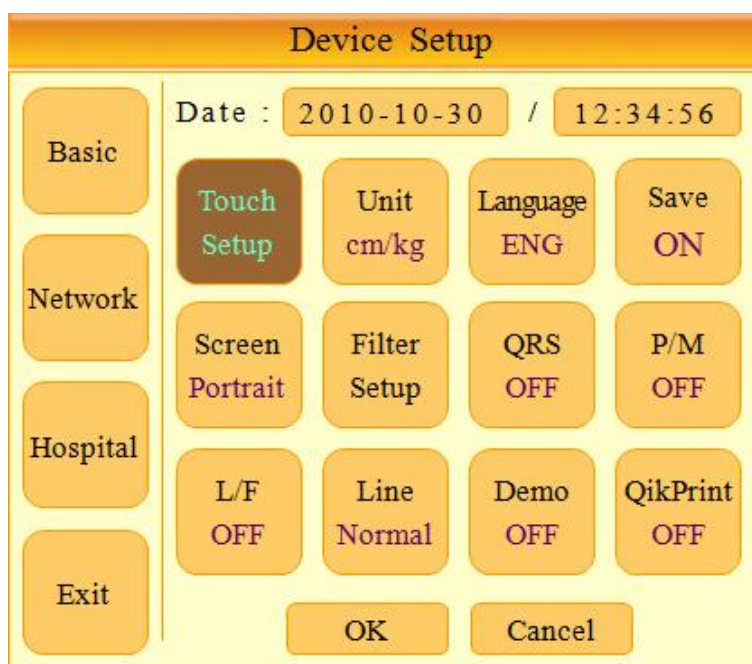
① Setup date and time

You can set month, date, hour, minute and second information using the rotary key in Date/Time menu. (Touch screen functionality update planned)



② Touch Setup

You can calibrate the touch screen by setting the coordinates.

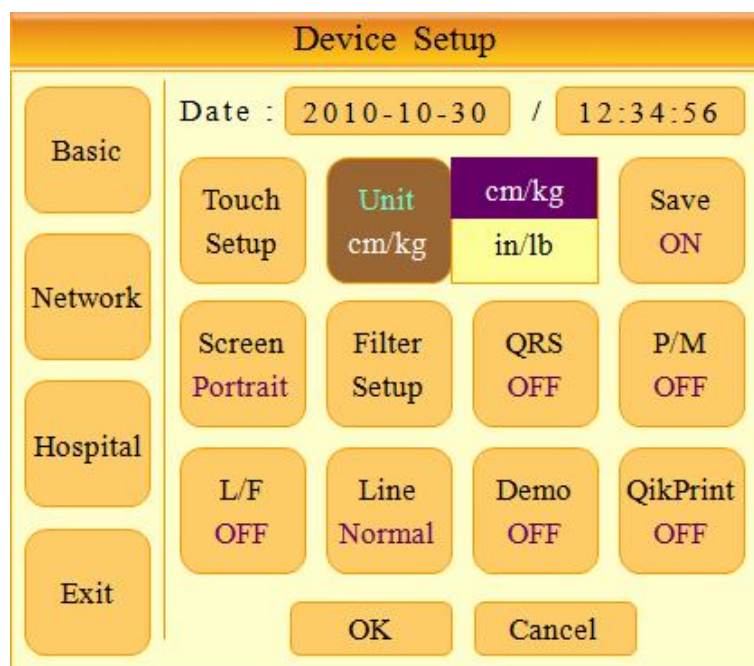


Note

When the user selects 'Touch Setup' menu, all windows will disappear and touch screen setup will start. No keys will be operational until Touch Setup is complete.

③ Unit

You can set units of Height and Weight information in Cardio7. Currently, users can choose between metric and imperial units; cm/Kg and in/lb

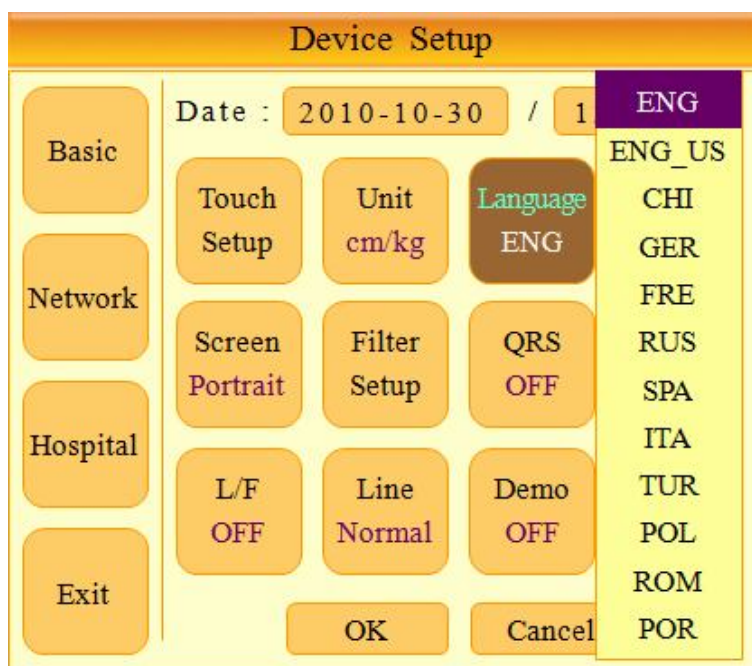


④ Language

You can set up language for displaying and printing in Cardio7. You can choose language among ENG(English), ENG_US(Capital letters printing), CHI(Chinese), GER(German), FRE(French), RUS(Russian), SPA(Spanish), ITA(Italian), TUR(Turkish), POL(Polish), ROM(Romanian) and POR(Portuguese).

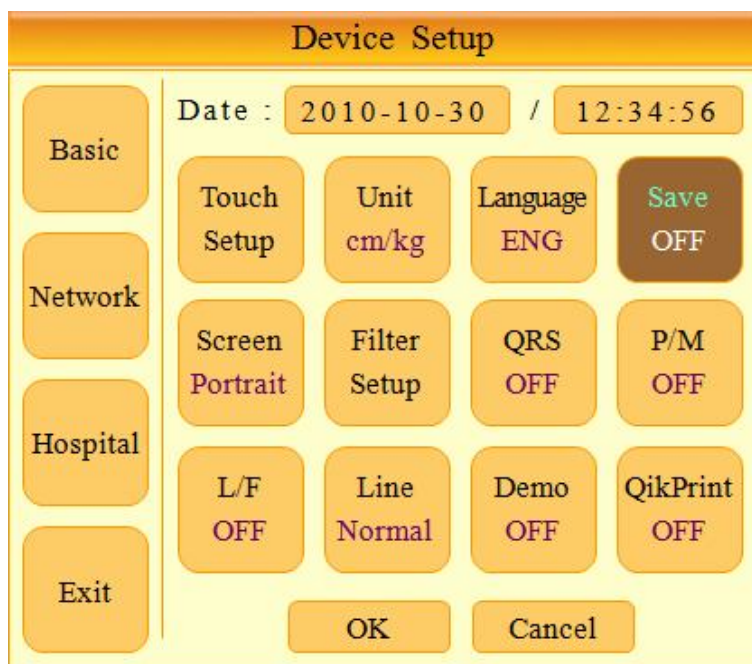
Note

When ENG_US is selected, printing paper will be set to Lettered(280mm) from A4



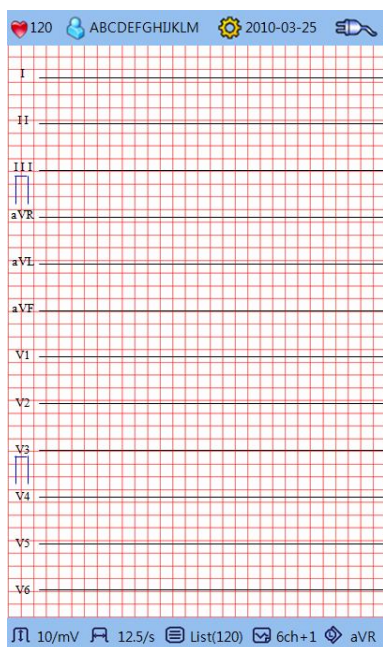
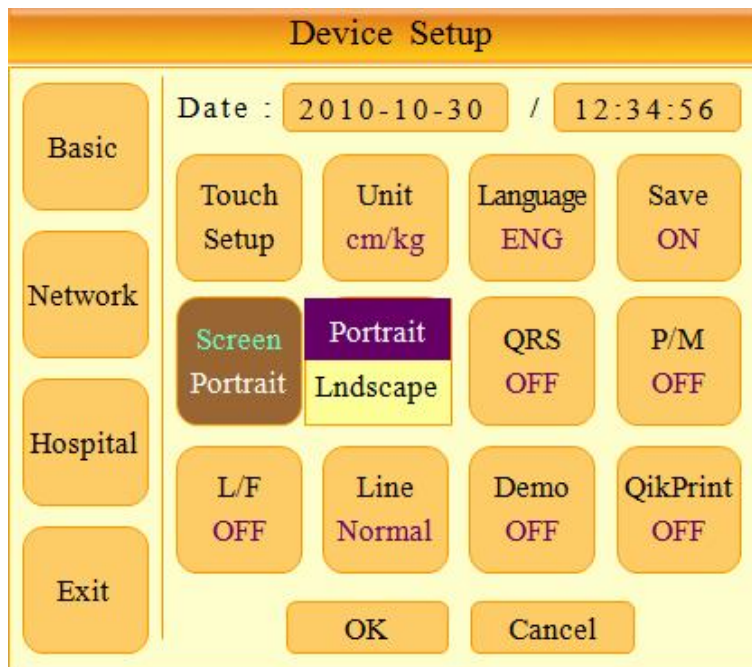
⑤ Saving

In this menu, users can decide whether a message box to ask user about saving data to appear or not. If ON is selected, there will be a message box asking users about data save. If OFF is selected, the message box will not appear and no data will be saved. Even if "Save" mode set to ON, it will not save any data at 60s and 5min modes.

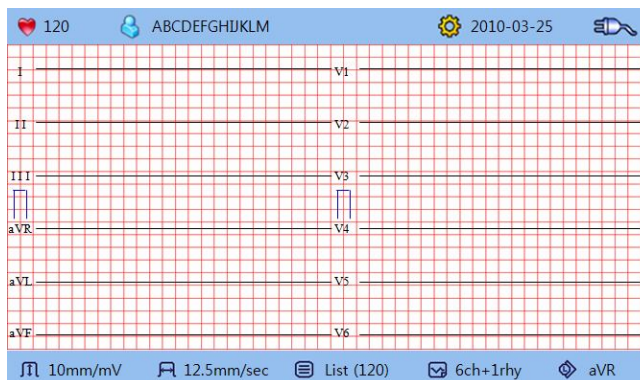


⑥ Screen Mode Setup

For screen mode, users can choose either portrait or landscape arrangements.



< Portrait Mode >



< Landscape Mode >

⑦ Filter Setup

The signal output generated by the device may contain extra unwanted signals in addition to EKG wave such as AC noise, BASE LINE DRIFT caused by respiration, noise generated by electrical field nearby, etc. Applying filters could help to reduce or remove those unwanted signals from the output of the device.

To change filter information, enter Filter Setup Menu either by moving selection block over and select it using rotary key or by touching the menu on the touch screen.

Device Setup				
Basic Network Hospital Exit	Date : 2010-10-30 / 12:34:56			
	Touch Setup	Unit cm/kg	Language ENG	Save ON
	Screen Portrait	Filter Setup	QRS OFF	P/M OFF
	L/F OFF	Line Normal	Demo OFF	QikPrint OFF
OK Cancel				

Upon selection, filter setup menu shown below will appear. Using either rotary key or touch screen to navigate and select menu items to edit. After editing, OK must be selected in order to apply changed value.

Filter Setup			
LPF 150Hz	AC 50Hz	Base ON	Muscle OFF
OK Cancel			

If recorded EKG signal contains a lot of noise, Low Pass Filter may help to clear it. For low pass filter, 40Hz, 100Hz, 150Hz and OFF option is offered. Here, 40Hz option means the filter will remove any unwanted signal with frequencies above 40Hz. Low pass filter values will appear on the bottom of the printout form; if LPF setting is OFF then as ~250Hz; if LPF setting is 40Hz then as ~40Hz; if LPF setting is 100Hz then as ~100Hz; if LPF setting is 150Hz, then as ~150Hz.



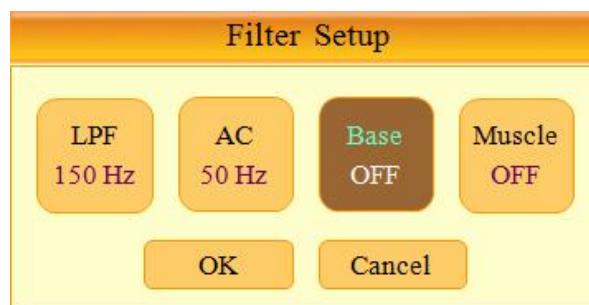
There are three types of the AC power noise filter; 60Hz, 50Hz and OFF. When set to OFF, the filter will not be applied. If the filter is set to 50Hz or 60Hz, then the AC filter will remove 50Hz or 60Hz power noise correspondingly. In Europe where the AC power is supplied at 50Hz, the AC filter should be set to 50Hz. In other nations including Korea and the U.S., it should be set to 60Hz. Check the properties of your power source before setting AC filter properties.

Under battery power, there would be no AC noise being generated. In this case, please set AC filter setting to OFF so that output signal would not be distorted.

The status of the AC filter can be checked on the bottom part of the printout - indicating AC 60Hz, AC 50Hz or AC OFF.

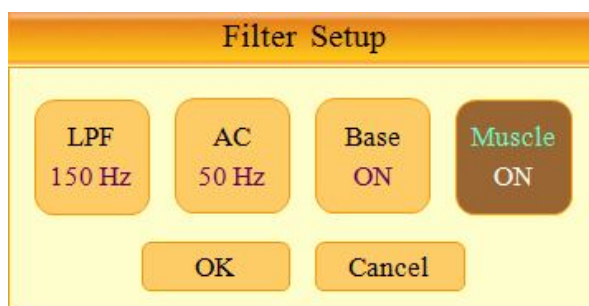


Base line drift is caused by the patient's breathing. It can be seen as ECG signals being overlapped on a large parabola. To remove Base line drift from EKG printouts, select ON. Otherwise, select OFF. The set value will appear on the bottom part of the printed form indicating 0.1Hz- when set to ON, and 0Hz- when set to OFF.



Electromyogram is caused by the patient's organs or muscle parts. When ECG is

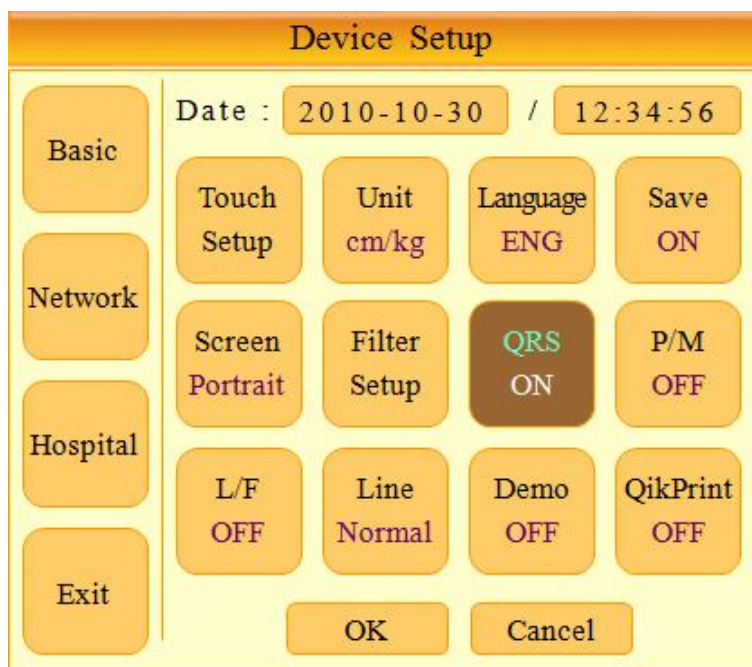
recorded on patients with strong electromyogram responses, ECG output may not be clear. In Cardio7, electromyogram can be eliminated by using Muscle Filter. Select ON to apply the filter to the output and OFF to get the unfiltered output. When you switch on the filter, EMG is indicated on the bottom of the printed form.



The use of filters can distort the original output. Therefore, you may reduce the possibility of signal distortion, if you set the filters OFF when the signals are clear. For your reference, we recommend that Baseline and AC filters should be set to ON most of the time. Use of the electromyogram filter should depend on signal conditions. When there is a lot of noise in the output, it is recommended that the LPF filter to be set to 40Hz.

⑧ QRS Sound Setup

In this menu, users can set the device to ring an alarm sound when QRS beat has generated while it is in waiting mode. Users can either set the alarm ON or OFF by selecting the menu with ON turning on and OFF turning off the alarm sound.



Note

No sound will ring while printing even when QRS Sound is set to ON.

⑨ Pacemaker Signal Display Setting

When a signal from patient's Pacemaker is registered by Cardio7, users can set whether to print location of pacemaker device in rhythm and diagnostic printing modes or not. In [P/M] menu within Device Setup, users can set it to either ON or OFF. ON placing pacemaker location on the printout, and OFF disabling pacemaker location print.

The screenshot shows the 'Device Setup' menu with a yellow background. On the left is a vertical sidebar with buttons: 'Basic', 'Network', 'Hospital', and 'Exit'. The main area displays various settings in a grid. At the top, 'Date' is set to '2010-10-30' and time to '12:34:56'. The settings grid includes: 'Touch Setup', 'Unit' (cm/kg), 'Language' (ENG), 'Save' (ON), 'Screen' (Portrait), 'Filter Setup', 'QRS' (OFF), 'P/M' (ON), 'L/F' (OFF), 'Line' (Normal), 'Demo' (OFF), and 'QikPrint' (OFF). At the bottom are 'OK' and 'Cancel' buttons. The 'P/M' button is highlighted in a darker color.

Device Setup				
Basic Network Hospital Exit	Date : 2010-10-30 / 12:34:56			
	Touch Setup	Unit cm/kg	Language ENG	Save ON
	Screen Portrait	Filter Setup	QRS OFF	P/M ON
	L/F OFF	Line Normal	Demo OFF	QikPrint OFF
OK Cancel				

Note

We recommend that [P/M] to be set to OFF in normal conditions and ON when measuring EKG of patients with a pacemaker.

⑩ Lead fault Signal Display Setting

When there is a lead fault event, this setup sets whether 'Lead fault' message will be displayed on the LCD screen of the device or not.

Selecting [L/F] menu will switch between ON and OFF in the menu, with ON turning on the message display and OFF switching off the message display.

Device Setup				
Basic Network Hospital Exit	Date :	2010-10-30 / 12:34:56		
	Touch Setup	Unit cm/kg	Language ENG	Save ON
	Screen Portrait	Filter Setup	QRS OFF	P/M OFF
	L/F ON	Line Normal	Demo OFF	QikPrint OFF
		OK	Cancel	

Following message for Lead fault will be shown with affected channels

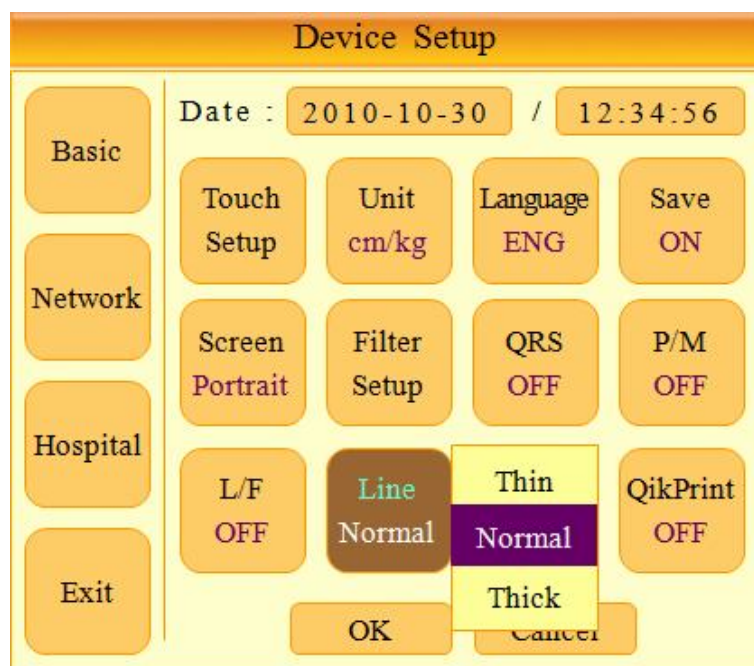
Lead Fault! All Leads.

Note

- If “RL” lead becomes faulty, the device will display a message saying all leads are faulty. (“Lead Fault! All Leads.”)
- If Leaf fault occurs during Monitoring or Recording, a buzzer alarm will sound and the message box will pop-up.
- No pacemaker signal may be detected. Additionally, if Lead Fault occurs, please re-measure EKG as it could have affected the measurement by the device.

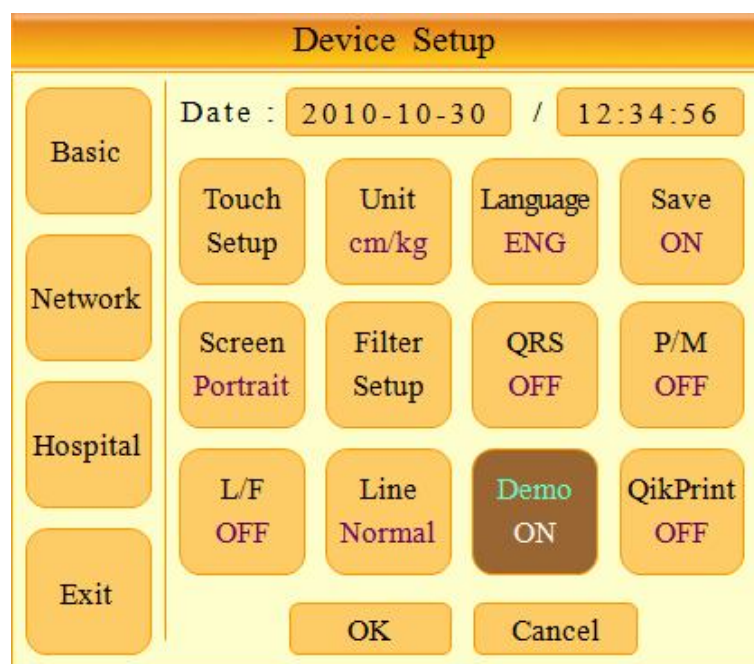
⑪ Line Thickness (Printing) Setting

This menu sets the thickness of lines in printouts. Thin indicates thin lines, Normal is regular thickness, and Thick in bold lines.



⑫ Demo Mode Setting

This menu puts Cardio7 in demo mode. When it is set to ON, 60bpm Sinus Normal Rhythm signal will be displayed on device and DEMO sign will appear on the upper part of LCD screen. Users can test rhythm, diagnostic, copy printing functions as well as PC communication and other miscellaneous functions in Cardio7.



⑬ QikPrint (Quick Printing) Setting

In this mode, users can choose to set or cancel QikPrint rapid printing function. When the function is ON, Cardio7 will save printing time by utilizing 5-second buffering.

Device Setup				
Basic Network Hospital Exit	Date :	2010-10-30 / 12:34:56		
	Touch Setup	Unit cm/kg	Language ENG	Save ON
	Screen Portrait	Filter Setup	QRS OFF	P/M OFF
	L/F OFF	Line Normal	Demo OFF	QikPrint ON
		OK Cancel		

Note

- When ON setting is used, you should operate by pressing Diagnostic Printing button after the signal is stabilized. The device will utilize data from 5 seconds prior to button pressing for the function, which means diagnostic information and output printout will be negatively affected if the signal is unstable.
- QikPrint(Quick Printing) setting only affects 10-second recording modes. It will not function on either 60-second or 5-minute recording modes.

Network Setup

In Network Setup, users will be able to set network information of the device. Neither automatic IP address assignment nor DNS setup functionalities are supported by Cardio7.

IP Address field sets unique IP address assigned to the device by the hospital's network provider. In DB server field, users can enter the IP address of the PC/Workstation where EKG data from the device will be transmitted to (i.e. IP address of the PC where BMS Plus software that can receive EKG information from device and store has been installed). For subnet mask and gateway field, usually same information from DB server can be entered.

The screenshot shows a 'Device Setup' dialog box with a yellow background. On the left is a vertical sidebar with four buttons: 'Basic', 'Network' (which is highlighted), 'Hospital', and 'Exit'. The main area of the dialog is titled 'TCP/IP Network Address' and contains four input fields: 'IPAddress' with the value '192.168.30.127', 'Subnet Mask' with '255.255.255.0', 'Gateway' with '192.168.30.1', and 'DB Server' with '192.168.30.74'. At the bottom right of the main area are 'OK' and 'Cancel' buttons.

TCP/IP Network Address	
IPAddress	192.168.30.127
Subnet Mask	255.255.255.0
Gateway	192.168.30.1
DB Server	192.168.30.74

* Network information can only be entered using the rotary key

Hospital Setup

Enter names of the hospital (clinic) and attending doctor which will be recorded and printed along with EKG data.

Device Setup

Basic

Network

Hospital

Exit

Hospital & Doctor Name

Hosp. Name

Dr. Name

OK

Cancel

9) Network Functions

Any previously acquired or newly taken measurements from the device can be transmitted to server PC/ Workstation for a comprehensive data management.

(1) Entering Patient Information




In order to transmit patient data from the device to a PC/ Workstation, patient information should be entered first. Note that the patient ID must be entered as it is a required input value for network functions.

(2) Sharing EKG Data without Printing

While in 'EKG Main' screen, pressing  key after entering the patient's ID will trigger a message box with text "Send new record data?" to appear. Select 'Yes' if one wishes to take a new EKG measurements then transmit; select 'No' to transmit any previously recorded EKG recordings; select 'Cancel' to abandon data transmission.

If 'Yes' is selected, the device will go through "Recording" → "Analyzing" → "Sending" processes as the data get transmitted to the server PC/ Workstation. If 'No' is chosen, the previously recorded data will be sent to the server PC/ Workstation without going through 'Recording' and 'Analyzing' processes.

(3) Transmitting Saved Data

After printing EKG data by pressing  button and saving the data to the device, the saved data can be transmitted to PC/ Workstation. Select  from the bottom of 'EKG Main' screen. Pressing  key will trigger the device to transmit data to PC/ Workstation, when 'Data Management' screen appears. For guides in managing acquired data, you should refer contents in '10) Data Management Screen' section.

NOTE

- Data transmission to PC can only occur while the server program on the PC is running. Therefore, please check to make sure the server program on the PC is in operation before pressing 'Communication/Pause' key on the device.
- If the size of the data for transmission is too large, it may take longer time (more than a minute) than usual.
- A transmission error could happen if the network communication is disrupted, while transmitting data to the PC. In this case, the device will display "Transmission Error" message first, then attempt to resend automatically 1 time and complete the transmission as long as the network disruption does not reoccur. However, if the disruption continues, the user will have to press 'Communication/Pause' key again to manually initiate data transmission. If the problem persists, the EKG device may have to be turned off then on to perform data transmission.
- When transmitting multiple sets of data to PC after saving, a network error could occur which may cause transmission halt and subsequent loss of data. Therefore, we recommend users to practice following procedures to minimize such loss.
 1. In EKG Main, press [NET] button to transmit data to PC immediately after measuring.
 2. When transmitting multiple sets of measurements, rather than sending all data at once, we recommend users to transmit individual data after each measurement.

10) Data management

(1) Window and function description

No	ID	Name	Data/Time	Type
1	0123456789	Jun Chang	10/10/10 12:30	ECG
2	1111111111	Hyonok Lee	10/10/10 13:30	ECG
① → 3	777	Yountae Im	10/10/10 14:30	ECG
4	987654321	Sunho Ryu	10/10/10 15:30	ECG
5	kkk	Namha Lee	10/10/10 16:30	ECG
6	abcdefg	Chris Oh	10/10/11 12:30	FVC
7	abcdefghijklm	Jay Shim	10/10/12 12:30	FVC+
8	1	Paul Lee	10/10/13 12:30	SVC
9	12	Jongeun Song	10/10/14 12:30	MVV
10	123	Dongju Kang	10/10/15 12:30	ECG
11	1234	Minsang Yoo	10/10/16 12:30	ECG
12	12345	Jongpil Chae	10/10/17 12:30	ECG
13	123456	Kyungsup Bang	10/10/18 12:30	FVC
14	1234567	Giyong Lee	10/10/19 12:30	SVC
15	12345678	Jeail Kim	10/10/20 12:30	MVV
16	123456789	Hyewon Choi	10/10/21 12:30	FVC+
17	1234567890	Jeonghyon Kim	10/10/22 12:30	ECG
18	12345678901	Cheonho Choi	10/10/23 12:30	ECG
19	123456789012	Seung Kim	10/10/24 12:30	FVC
20	1234567890123	Youngwoo Park	10/10/25 12:30	FVC

<<
>>
3/120
ECG
INFO
DEL
PRT

②
③
④
⑤
⑥
⑦
⑧

- ① Currently selected data
- ② Previous page
- ③ Next page
- ④ Current cursor position/Number of all data.
- ⑤ Previous menu (shown as ECG or SPR) – Show menu prior to entering data management screen
- ⑥ Display information of highlighted patient
- ⑦ Delete highlighted data from the device
- ⑧ Print highlighted data


* When you move to the right or left with the rotary key at the first or last data, data will be shown per page.

* When you select Info, Delete or Print with no data saved, the following message is displayed.

SYSTEM MESSAGE

No Data..

(2) Sending Data

With () key, users can transmit saved data to PC/ Workstation.

- Attempting connection to PC/ Workstation

SYSTEM MESSAGE

DB Connecting...

- Transmitting Data to PC/ Workstation

SYSTEM MESSAGE

Sending Saved Data[]**

- Indicating that the data transmission is finished

SYSTEM MESSAGE

Transmission Complete!

* System Message: if a connection to PC has failed

SYSTEM MESSAGE

Connection Error

* System Message: if a data transmission has failed

SYSTEM MESSAGE

Transmission Error

WARNING

When a defibrillator is used, do not touch the patient cable or apparatus.

WARNING

When you are connecting to the electrodes or the patient cable, make sure connectors never come into contact with any other conductive parts, or with earth. In particular, make sure that all of the ECG electrodes are attached to the patient, to prevent them from contacting conductive parts or earth.

WARNING

Use provided ECG patient cable for measuring ECG in the operating room. Patient cable cannot be used for measuring respiration.

WARNING

Do not use Cardio7 in combination with any Electro-Surgical (ES) equipments.

WARNING

Users must use same type of electrode or any other electrodes with biocompatibility certification proven by one of international standards.

WARNING

Cardio7 must be operated by under health care professionals, especially when it is used on pacemaker treated patient.

Chapter 4. System Management

- 1) Maintenance and Cleaning
- 2) Regular Check-up
- 3) Trouble Shooting

1) Maintenance and Cleaning

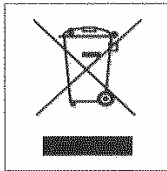
There are various ways to keep Cardio7 clean and well-maintained. This section outlines several actions that could damage or stain to the machine permanently and thus needs to be avoided by operators of the device. If unapproved materials that may cause damage to the product were used, the product warranty may not be honored even though the period of guarantee may not have been expired.

WARNING

- Check main unit and electrodes thoroughly after cleaning.
- Do not use the old and damaged equipment on patients!

- To keep the device clean, apply alcohol on a soft cloth and scrub the body and the measuring electrodes with the warm water once a month. Do not use lacquer, thinner, ethylene, or the oxidizing substance.
- Keep cables from dust or stain. For cable maintenance, wipe the cable with a cloth that is wet with warm water (40C/ 104F) after each use, and with the clinical alcohol once a week.
- Do not soak the device and its cables into any liquid or detergent. Keep the machine and its cables away from any liquid.

Disposal of your old appliance



1. When this crossed out wheeled bin symbol is attached to a product it means the product is covered by the European Directive 2002/96/EC.
2. All electrical and electronic products should be disposed separately from the municipal waste stream via designated collection facilities appointed by the government or the local authorities.
3. Correct disposal of your old appliance will help prevent potential negative consequences for the environment and human health.
4. For more detailed information about disposal of your old appliance, please contact your local government office, waste disposal service or local distributor where the product was purchased.

2) Regular Check-up

Perform the safety inspection on Cardio7 periodically for at least once a year. See the service manual provided by Bionet for details on the inspection of Cardio7.

3) Trouble Shooting

(1) When nothing or blurred out lines are being printed, during print out operation.
→ The upper cover of the printer may not have closed properly. Check and close the upper cover completely before using the machine.

(2) When the device is on battery instead of AC power, the buzzer rings for three times consecutively and the following message is displayed on the screen:

SYSTEM MESSAGE

Battery Low

→ The battery is almost used up. Connect the AC power supply in order to continue operating the machine.

(3) When the device is printing EKG results, there is a lot of noise added to the signal:

→ Check whether the AC power supply filter is set up properly. If it is still noisy, even though AC power supply filter is ON, connect the ground wire to the GND electrode of the system. Do not use the GND with that of AC power supply. Instead, connect GND to the patient's bed or any other metal around the device that is connected to the building's wall.

* If you continue to have problems even after following aforementioned the points, or other problems that is not mentioned above, contact nearest A/S center.

Chapter 5. Specification

ECG leads	12 standard leads, acquired simultaneously and continuously
Dimension	296(W) x 305.5(H) x 92.5(D)mm, approx. 3.5kg
Recording channel	3, 6, 12 channels 10 seconds recording and beat report 1 channel 60 seconds or 5 minutes recording
Sensitivity	2.5, 5, 10, 20, auto(I~aVF: 10, V1~V6: 5) mm/mV
Printing speed	12.5, 25, 50 mm/s
Filters	AC(50/60 Hz, -20dB or better) Muscle(25~35Hz, -3dB or better) Base line drift(0.1Hz, -3dB or better) Low pass filter: off, 40Hz, 100Hz, 150Hz
Display	7 inch 800x480 pixel Color TFT LCD display & 12 channels preview
Monitor display	HR, ID, date, AC or Battery state, sensitivity, speed, number of saved data, printing form, rhythm lead
User interface	Touch screen(Alphanumeric keyboard and keypad), push button and rotary switch
Patient data	ID, name, age, sex, height, weight, Race, smoke
Basic measurement	Heart rate, PR, QRS, QT/QTc, P-R-T axis
Recorder	Thermal print head, roll paper Report paper: width:A4:210mm or 8.5", length:A4:300mm or 11" Resolution: vertical: 8dot/mm, Horizontal: 16dot/mm
Electrical	Resolution : 500 sample/sec. Internal noise : 20 μ V (p-p)max Input impedance : $\geq 10 M\Omega$ Input range : $\geq \pm 5mV$ Common mode rejection : $> 100dB$ DC offset voltage : $\geq \pm 300mV$ Time constant : 3.2sec Patient leakage current : $< 10 \mu A$ Frequency response : 0.05 ~ 150Hz Isolated and defibrillation protected
Signal quality control	Disconnected lead detection, Pacemaker pulse detection
ECG data storage	storage for 120 ECGs (Internal on flash memory)
Power	Power supply: AC or built-in battery(option) 95 ~ 240 VAC, 50/60Hz, 1.0 ~ 0.5A, 60W max
Battery(Ni-MH)	1 hour of normal use (approx. 100 ECG printouts)
Communication	PC connection with RS232 interface and LAN
Safety conformity	Class I , Type BF

Cardio7 Operation Manual

Environment	Operating humidity: 30~85% Operating temperature: 10 ~ 40℃ Atmospheric pressure: 70 ~ 106KPa
Standard accessory	Power cord 1 EA, Patient cable 1 EA, Limb 1 set(4 EA), Chest ball 1 set(6 EA), Chart paper 1 EA, Operation manual 1 EA
Options	Rechargeable battery, Cart, Hanger

WARRANTY

Product Name	Electrocardiograph
Model Name	Cardio 7
License Number	
License Date	
Serial Number	
Warranty period	1 year from the date of purchase (2years in Europe)
Date of purchase	(yyyy/mm/dd)
Customer	Hospital: Address: Name: Contact No:
Seller's Name	
Manufacturer's Name	

- ※ Thanks for purchasing Cardio 7.
- ※ This product is a medical machine.
- ※ This product meets the strict quality requirements thoroughly.
- ※ The repairing and compensation standards follow the consumer damage compensation regulations of the Ministry of Finance and Economy.

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Bionet Co., Ltd

Model Name: Cardio 7